



Issues and Recommendations

Opportunities for Commercial Users and Providers

63/18 0292/15



TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Introduction	i
Acronyms and Abbreviations	iii
General	
Administrative/Operations	1
International	9
Pricing	11
Centers for the Commercial Development of Space	13
Proprietary Data	16
Procurement	17
Materials Processing in Space	23
Earth and Ocean Observations	42
Life Sciences	60
Infrastructure Services	62
Infrastructure Policy	74
Appendix A	
NASA Points of Contact	

INTRODUCTION

This Issues and Recommendations report represents a compilation of responses to issues and questions raised at the Space Station Freedom Workshops held in Denver, Colorado (October 25-28, 1988) and Nashville, Tennessee (November 3-5, 1987). During the review of the document, some issues and recommendations were omitted due to duplication and applicability.

The document is divided into sections representing the commercial user and provider application areas that participated in the Space Station Freedom Workshops:

- General
- Materials Processing in Space
- Commercial Earth and Ocean Observations
- Life Sciences
- Infrastructure Services
- Infrastructure Policy

In addition to the 163 issues, questions and recommendations which have been categorized by each commercial user and provider area, a general section has been included which covers broad technical and policy issues relating to all of the commercial user and provider application areas.

A Space Station Commercial Infrastructure Policy panel also met to discuss technical, business, financial, and policy questions and issues. The responses by the panel were in accordance with the draft Space Station Freedom Commercial Infrastructure Policy and Procedures that was released and distributed at the Denver workshop. This draft was released for the purpose of soliciting both internal comments from NASA personnel and external comments from industry. As of this publication date, this document is still in draft form. Any responses made by the panel during this session may be subject to change when this review process has been completed and the document is revised and approved. The draft Space Station Freedom Commercial Infrastructure Policy and Procedures appears in the Denver Space Station Freedom Workshop Proceedings.

Responses to these issues and recommendations were provided at the Workshops or have been developed by NASA personnel whose expertise best qualifies them to address the topic. The entire document has been reviewed and updated by NASA Headquarters and Field Center organizations since the Denver workshop.

The responses contained herein represent the best answers available at this time. It should be understood, however, that certain issues, especially those involving policy matters, are continuing to evolve, thus some future modifications may be expected.

For your convenience, a point of contact is included in each response to obtain further information. A list of contact names, phone numbers and organizations are included in Appendix A. A list of acronyms and abbreviations used throughout the text is included on page iii of the document.

ACRONYMS AND ABBREVIATIONS

AO	Announcement of Opportunity
APAE	Attached Payload Accommodation Equipment
CCDS	Center for Commercial Development of Space
CDSF	Commercially Developed Space Facility
CICA	Competition in Contracting Act
CNES	Centre National D'Etudes Spatiales
Code C	Office of Commercial Programs
Code E	Office of Space Science and Applications
Code EN	Microgravity Science and Applications Division
Code M	Office of Space Flight
Code Q	Office of Safety, Reliability, Maintainability and Quality Assurance
Code R	Office of Aeronautics and Space Technology
Code S	Office of Space Station
Code T	Office of Space Operations
CUS	Commercial Uses of Space
CVD	Chemical Vapor Deposition
DMS	Data Management System
ELV	Expendable Launch Vehicle
EOS	Earth Observing System
ESA	European Space Agency
EVA	Extra Vehicular Activity
FAR	Federal Acquisition Regulations
FCC	Federal Communications Commission
GEO	Geostationary Orbit
IAC	Industrial Application Center
IVA	Inter Vehicular Activity
JEA	Joint Endeavor Agreement
JEM	Japanese Experiment Module
JOFOC	Justification of Fair and Open Competition
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
LEO	Low Earth Orbit
LFC	Large Format Camera
LSE	Laboratory Support Equipment

MCF	Modular Combustion Facility
MODIS	Moderate-Resolution Imaging Spectrometer
MOU	Memorandum of Understanding
MPS	Materials Processing in Space
MRDB	Mission Requirements Database
MSAD	Microgravity Science and Applications Division
NASDA	National Space Development Agency of Japan
OAST	Office of Aeronautics & Space Technology
OCI	Ocean Color Imager
OCP	Office of Commercial Programs
OMB	Office of Management and Budget
OSSA	Office of Space Science and Applications
PI	Principle Investigator
PRD	Program Requirements Definition
RFP	Request for Proposal
SAR	Synthetic Aperture Radar
SBIR	Small Business Innovative Research
SEM	Scanning Electron Microscope
SSP	Space Station Program
STIF	Scientific & Technical Information Facility
STS	Space Transportation System
SUMITS	Station User Mission Information Tracking System
SURF	Space Ultra-vacuum Facility
TDRSS	Tracking & Data Relay Satellite System
USML	United States Materials Laboratory
USRA	Universities Space Research Association

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

GENERAL

Administrative/Operations

Item # 1 (Denver):

Will NASA retain the administrative responsibility of Space Station Freedom throughout its life span or will that change as commercial requirements begin to assume a major role in its functions?

Response:

NASA will initially have the administrative responsibility. Whether that continues for the life of Space Station Freedom is a moot point. (Richard Halpern)

Item # 2 (Denver):

What are the planning units for Space Station Freedom?

Response:

The planning increments are fixed times between shuttle arrivals at Space Station Freedom. The fact that you plan for one increment does not preclude you from staying for two increments or more. The increment planning will be done in large part for those facilities already on Space Station Freedom. (Richard Halpern)

Item # 3 (Denver):

How will the Associate Contractor relationship work?

Response:

The receiving contractor is contracted to review and checkout the requirement design and its software. If there is a problem with the item when it is delivered, it becomes a joint problem between those two contractors. Thus, the government is not in the middle. (Jim Odom)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 4 (Denver):

What is the first scientific experiment to be done on Space Station Freedom?

Response:

Early manned tended configuration will be accomplished with shuttle flight # 4. At this time there will be two double racks available for user activity. (Remer Prince)

Item # 5 (Denver):

What is the current interest shown by DOD, in any field, for the use of Space Station Freedom?

Response:

There is interest in utilizing an optical quality earth viewing window for earth observations, if so equipped. (David Brannon)

Item # 6 (Nashville):

NASA should conduct future CEO level workshops on business and policy issues.

Response:

The Office of Commercial Programs and its contractor, Boeing Aerospace Operations/Peat Marwick Main & Company (BAO/PMM), have developed a CEO-level brief for presentation to industry. In addition, the NASA/Office of Commercial Programs, Technology Utilization Division (NASA/OCP/TUD) is using its contract with Boeing Aerospace Operations/Peat Marwick Main & Company (BAO/PMM)--based on a three-year requirement ending October 1989--to provide technical and business marketing services for the purpose of informing, stimulating, and sustaining industrial interests in commercial space research and development. Under this contract, Boeing/Peat Marwick interacts directly with industry (i.e. meetings, briefings, conferences, seminars, and presentations) to communicate government policy and procedures as well as to provide business guidance in terms of the viability of a proposed commercial space venture.

In addition to the services provided by BAO/PMM, NASA/OCP/TUD maintains an Industrial Application Center (IAC) network consisting of ten Industrial and State Technology Application Centers located throughout the United States. Each IAC is chartered with regional responsibility to transfer and encourage the rapid commercialization of the Agency's technology by the private sector. In addition to responding to industry's continuing and changing need for information/technology transfer products and services, IAC's also participate in and promote commercial uses of space (CUS) activities through involvement in numerous educational, technical, and government (i.e. federal, state, and local) workshops, exhibits and presentations, trade association functions, and client services. IAC services combine technology search

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

activities--access to the NASA technology and other data bases--and CUS marketing objective efforts to build relationship with the private sector. All 10 IACs maintain a calendar of events listing technical and business activities (e.g. Small Business Innovative Research (SBIR) Workshops, Industrial Trade Shows, TUD/CUS Workshops, and Technology Information System Training Seminars) and maintain a supply of marketing materials (i.e. brochures, flyers, posters, and other information items) for distribution to the public.

Both BAO/PMM and the IACs provide guidance to the private sector in the preparation of proposals for commercial space-related activities and provide assistance relative to the availability of government resources (e.g. facilities, hardware, and manpower support) and known costs, if any, to facilitate and expedite the processing of any cooperative effort with the government. (Arlene Kahn)

Item # 7 (Denver):

How does NASA propose to accomplish the list of continuing Spacelab missions into the 90's, and build a space station at the same time?

Response:

There is no question it's going to be a very ambitious goal. These are not inexpensive space options. Hopefully they will be deemed worthy goals of the U.S. and NASA will get the funding to make that possible. Funding will have to be increased substantially. (Steve Fogelman)

Item # 8 (Nashville):

NASA needs to provide essential support such as waste handling, environmental health, and water.

Response:

Essential services such as waste handling, environmental health, and water are all provided as part of the Space Station Freedom lab module design. Requirements for these services are addressed in the Mission Requirements Data Base (MRDB) and are based on the requirements identified to NASA. (Dan Herman)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 9 (Denver):

Please comment on NASA's rapid response philosophy in terms of payloads in all disciplines?

Response:

Rapid response payloads are those payloads which come into the system 2 to 3 years prior to launch. Once the user sponsor groups are given allocations at the 5 year level, they can use those allocations as they see fit. Thus, they can set aside a certain percentage for rapid response payloads. However, it is important to mention that the complexity of the payloads will dictate whether they fit into the rapid response timeframe. For example, if one is using an existing facility, the entire integration process is much faster than if actual hardware is being transported to Space Station Freedom. (Richard Halpern)

Item # 10 (Denver):

What is the current policy for contacting, disseminating information to, and funding prospective Space Station Freedom Science Investigators?

Response:

The dissemination of Space Station Freedom information will be through the various user organizations. The current policy for contacting and funding Space Station Freedom Science Investigators is through the Office of Space Science and Applications. This is usually done in response to an Announcement of Opportunity. Those selected are usually funded to build their equipment, to provide samples that will be used in the case of existing facilities, or to aid in data reduction activities. The Office of Space Station will not build any scientific or technological instruments. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 11 (Nashville):

NASA should include commercialization goals in the performance evaluations of NASA employees.

Response:

NASA agrees that commercialization goals are important when evaluating personnel that are involved with the commercialization process. Many NASA employees, however, are not involved with this process and are evaluated according to their specific job requirements.

The NASA performance evaluation system is based on a personalized agreement made between employees and their supervisors. Specific goals are established to meet job related requirements.

NASA will support the commercialization effort by making supervisors aware of the need to identify commercialization goals if appropriate. **(Franklin Sutherland)**

Item # 12 (Nashville):

The Office of Commercial Programs should discuss the potential marketing of TMIS access service with the Office of Space Station.

Response:

NASA recognizes the importance of Space Station Freedom information to all commercial users. The Agency has determined, however, that at this time, the marketing of TMIS access would not be the best means to provide this information. **(Kevin Barquinero)**

Item # 13 (Denver):

What is Kennedy Space Center's role in servicing Space Station Freedom?

Response:

Kennedy Space Center is generally responsible for integrating and deintegrating the Space Station racks, propellant containers, etc., into the logistics carriers and integrating and deintegrating the logistics carriers into the Shuttle. The integration of payloads and experiments in the Space Station racks will generally occur at other NASA or partner centers. **(Robert Clark)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 14 (Nashville):

NASA needs to examine various incentives and business issues.

- a. the National Space Biotechnology Laboratory concept
- b. tax incentives
- c. protection of proprietary rights for existing space technology and future technological gains from space research
- d. getting early FDA participation to help bring a space product at least to the head of the queue
- e. the technical advantages through cooperative research activities
- f. multidiscipline research and marketing opportunities via NASA-related companies
- g. the incentive to spread the risk, which is the whole purpose of research
- h. new proposals with innovation through the Centers for the Commercial Development of Space

Response:

NASA agrees with the need to address the various business and incentive recommendations stated above.

- a. A National Space Biotechnology Laboratory appears to be a good idea and should be pursued. The biotechnology area is rapidly growing, changing, and evolving and it is difficult to plan experiments seven to eight years in advance. A National Space Biotechnology Laboratory would help to coordinate these activities.
- b. At this time it is unclear whether changing legislation to provide tax incentives would encourage enough commercial development to warrant such an effort. The Code C/Code S Steering Committee is willing to revisit this issue if adequate justification can be presented.
- c. Protection of proprietary rights is addressed in both the NASA Commercial Space Infrastructure Policy and the Space Station Freedom Commercial Infrastructure Policy. NASA will continue its policy to protect proprietary information.
- d. NASA strongly supports this recommendation. It would welcome FDA participation and will work for cooperation when a product comes to our attention. The issue of putting space products at the head of the queue is complex and will require FDA study.
- e.-h. The CCDS program should provide an open channel for potential users a.A National Space Biotechnology Laboratory appears to be a good idea and should be pursued. The biotechnology area is rapidly growing, changing, and evolving and it is difficult to plan experiments seven to eight years in advance. A National Space Biotechnology Laboratory would help to coordinate these activities.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

The CCDS as a consortia is strongly influenced by the needs of its private sector affiliates. All CCDS are looking for new and innovative ideas relative to their individual charters. In some instances (e.g. Ohio State's Center for Mapping), the CCDS actively solicits new proposals from outside the CCDS. Several of the projects sponsored by the CCDS program project a use of space facilities with long duration capability. All CCDS would be delighted to talk with potential industrial affiliates about using space facilities (e.g. Space Station Freedom) and would, as a part of their normal activities, serve as a conduit to incorporate affiliate requirements for space facilities. (Barbara Stone, Ana Villamil)

Item # 15 (Denver):

How will universities get manifested or involved?

Response:

They can get involved through notices of opportunity announcements. (Robert Clark)

Item # 16 (Denver):

Will there be adequate transportation to meet the demand to support and utilize the Space Station Freedom?

Response:

Twenty-one flights are scheduled over a three year period for assembly and outfitting of the Space Station Freedom. Five flights per year are scheduled thereafter for crew rotation and resupply. Given the high priority the Space Station Freedom holds within the Agency, adjustments to the schedule and/or enhancements to the Space Transportation System could be made to meet the flight demand. The allocations for payload organizations including those sponsored by OCP have not yet been established by the Administrator. (Gar Misener)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 17 (Denver):

What are the prospects for Code C allocations for flight opportunities?

Response:

The Office of Commercial Programs (OCP) has been allotted 31% of the secondary payload space on the Space Shuttle for its sponsored payloads along with an additional 1% for reimbursable domestic users. The CCDS and JEA partners have submitted their flight programs to NASA for consideration and these are being weighed against the projected availability. OCP has also initiated a Sounding Rocket program through the CCDS's and is currently investigating ELV possibilities to augment the opportunities.

Payload opportunities on Space Station are currently being studied through the Payload Manifest Working Group under the Space Station Freedom Program Office. (Gar Misener)

Item # 18 (Nashville):

NASA should establish a powered free flyer.

Response:

Congress has requested independent studies through the National Association of Public Administration and National Research Council for a Commercially Developed Space Facility (CDSF). These studies began in September 1988 and were completed in the first quarter of 1989. After reviewing both of these studies, NASA does not plan to take any additional action on the CDSF proposal. NASA will continue to encourage and strengthen commercial investment and involvement and will evaluate the utility of commercially produced microgravity facilities during the course of Space Station Freedom development. (Ralph Hoodless)

Item # 19 (Nashville):

NASA should improve JEA processing procedures.

Response:

Code C is now implementing a revised procedure by which NASA will review JEA's. Early indications are that this revised procedure will eliminate much of the past inefficiencies on NASA's side. Code C has also established a standing committee of high level NASA executives to evaluate proposals early in the review process. (Barbara Stone, Jack Yadvish)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

International

Item # 20 (Denver):

Will English be the common language for commercial users/investigators associated with Freedom?

Response:

English will be the common language for Space Station Freedom Program command, communications, and tracking. More information should be obtained from the Office of Space Station Utilization Division (Code SU). (Richard Halpern)

Item # 21 (Denver):

If a U.S. user wants to use a foreign provided facility, is it necessary to find a U.S. government sponsor?

Response:

The user must go directly to the foreign partner, and U.S. sponsorship is not necessary. However, the Office of Commercial Programs will do what it can to assist the users in their efforts. (Richard Halpern)

Item # 22 (Denver):

What steps is NASA taking to assure there is no unnecessary duplication of experiment/processing facilities on the U.S., European, and Japanese elements of Space Station Freedom?

Response:

NASA Headquarters is delivering a national utilization plan to avoid duplication of equipment. The Office of Space Station is currently doing a study to standardize racks and identify who has what equipment. Working with user codes, OSSA is performing a science study looking at what payload hardware will be involved on Space Station Freedom. It is planned to share furnaces, etc. with international partners, but essentially the users will decide the extent to which facilities will be duplicated and shared. The objective is a truly integrated space station in which basic research will be shared with protection for proprietary data. We should not segregate research activities on a national basis. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 23 (Denver):

What are the ground-rules for use of the ESA free-flyer?

Response:

The ESA man-tended free-flyer is being built by and belongs to ESA. Any services required for the flyer will come from the ESA shares of Space Station Freedom. The U.S. has the right to access 25% of the flyer for which use we will pay ESA. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Pricing

Item # 24 (Denver):

Will price be a disincentive to users who require multiple flights per year?

Response:

The Pricing Policy will be completed by late 1989 or early 1990. See Item #25 for the status of the pricing policy. **(Richard Halpern)**

Item # 25 (Denver):

Industry interested in space based research needs to know the costs involved. When will NASA be able to tell industry the approximate costs for access, power, communications, and transportation?

Response:

The Pricing Policy will be completed by late 1989 or early 1990 when it will be needed for the first Utilization Plan. Thus far, NASA has:

- submitted to Congress its activities to date with regard to the Pricing Policy;
- examined some of the services required to be costed out on Space Station Freedom such as integration;
- discussed communication costs through the use of TDRSS;
- discussed transportation costs defined by the shuttle pricing policy;
- and looked at determining costs by either demand based cost or operational based cost.

One price will be charged to customers to cover all services provided. The Pricing Policy will be widely disseminated upon completion. **(Richard Halpern)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 26 (Denver):

Regarding cost/pricing policies for industry use of Space Station Freedom, heavy cost burdens will lock small business out of the Space Station Freedom. Will pricing be varied to allow small businesses access?

Response:

Every effort will be made to include small business involvement in the Space Station Freedom Program. Further expansion of this subject should be directed to the NASA Office of Commercial Programs (Code C). See Item #25 for the status of the Pricing Policy. (David Brannon)

Item # 27 (Denver):

Are all partners charging the same price for services offered?

Response:

There are no requirements for each partner to charge the same price. Thus, there is a possibility that one country or another will subsidize to a greater extent the commercial activity for the use of the facilities. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Centers for the Commercial Development of Space

Item # 28 (Denver):

Will there be two more CCDS this year and what is the solicitation process?

Response:

A budget has been proposed for two more CCDS's; approval is still pending. We are following CCDS efforts currently underway before we commit to two more. No functional area decisions have been made yet.

Since the beginning of the CCDS program in 1985, a competitive solicitation process has been used to select candidates for award of a grant. Prior to the release of a RFP, the proposed solicitation is announced in the Commerce Business Daily publication. After release of the RFP, a bidders conference is held to answer questions about the RFP. Proposals received in response to the RFP are reviewed by a team of experts chosen from industry, academia and government in technical, financial, and managerial disciplines. Proposals recommended for selection by the review team are submitted to the Assistant Administrator for Commercial Programs for referral to the NASA Administrator. Following selection by the NASA Administrator, all proposers are notified and a press announcement is released. **(Janelle Brown)**

Item # 29 (Denver):

Will the CCDS get a price break and manifest priority in doing research on Space Station Freedom so that it is advantageous for a company to join a CCDS?

Response:

The administrator will allocate a portion of U.S. resources to commercial clients. The Office of Commercial Programs will be looking for every price break and for every opportunity to manifest the CCDS as fast as it can. **(Richard Halpern)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 30 (Denver):

In previous funding for Centers for the Commercial Development of Space (CCDS), industry as a whole did not keep their promises for funding these centers. Did NASA and the taxpayers end up footing much of the bill?

Response:

The nature of the award is such that OCP at NASA supports us with \$1 million annually for 5 years. We are to be self-sustaining after that time. Industry has been approached for participation in our particular field of microgravity and efforts are continuing. In the first year, industry has provided support monetarily, with in kind services, equipment donations or leases and through industrial representatives learning and teaching at the university. From a survey conducted by the CCDS as a whole, last year all Centers received approximately \$2.5 in cash and in kind services for every \$1 provided by NASA. That number includes the newer centers such as Penn State, where the cash and in kind services were lower. (Wes Hymer)

Item # 31 (Nashville):

CCDS need to be useful for a wider variety of needs.

Response:

The CCDS program is designed to encourage industrial involvement in space. As a consortia, they are striving to mold academic/industrial teams in a manner which best overcomes the deficiencies of each. The CCDS are currently involved in a number of research areas and disciplines:

- space processing of engineering materials
- space vacuum epitaxy
- satellite mapping
- space remote sensing
- commercial crystal growth
- space automation and robotics
- materials for space structures
- cell research
- bioserve space technologies
- space power
- space propulsion

(Ana Villamil)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 32 (Nashville):

NASA should encourage the formation of consortia to undertake high risk commercial projects.

Response:

One of NASA's initiatives is to help mitigate the high risk in commercial space ventures in the formation of the CCDS program. In the last three years, NASA has awarded sixteen CCDS grants to support various commercial space research and development projects. (Ana Villamil)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Proprietary Data

Item # 33 (Nashville):

NASA should waive FAR requirements that give NASA rights to proprietary data.

Response:

The FAR and NASA's FAR Supplement enable a contractor to protect qualifying proprietary data by withholding the data from delivery to the Government and delivering form, fit, and function data in lieu thereof. However, when NASA has a need for proprietary data, contract provisions enable the contractor to deliver the data with limited or restricted rights. (Bob Kempf)

Item # 34 (Nashville):

NASA should issue idea patents (internal and external) with an initial option payment to ensure that the company is credible and committed to the idea. Idea patents would protect proprietary ideas presented to NASA for consideration from being disclosed in a RFP.

Response:

There is no such thing as an idea patent and NASA has no authority to issue one; Title 35 U.S.Code. However, the issue appears to be one of protecting unsolicited proposals.

NASA uses unsolicited proposals only for evaluation or review purposes, unless otherwise specified by law. The handling of unsolicited proposals is addressed in the NASA FAR Supplement, Subpart 18-15.5.

The disclosure of information concerning trade secrets, processes, operations, style of work, apparatus and other matters contained in an unsolicited proposal by a Government employee, except as authorized by law, may result in criminal penalties under 18 USC 1905. (Bob Kempf)

Item # 35 (Denver):

What data privacy provisions are established for protecting commercial data transmissions from Space Station Freedom?

Response:

There are provisions in the Space Station Freedom Memorandum of Understanding which allow each partner agency to encrypt data and to provide protection for the proprietary data. For manned base operations there is a requirement in the Program Requirements document that make provisions for users who want to have proprietary data. This is being worked through Level 2 Information Systems Security and Privacy Working Group. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Procurement

Item # 36 (Nashville):

NASA should ease the process of accepting and acting on unsolicited proposals.

Response:

An unsolicited proposal by definition (FAR 15.501) is a written proposal that is submitted to an agency on the initiative of the submitter for the purpose of obtaining a contract with the government. It is not a proposal in response to a formal or informal request (other than an agency request constituting a publicized general statement of needs). The unsolicited proposal mechanism is not intended as a marketing tool for selling standard products and services to NASA. Indeed, a submission is not considered a valid unsolicited proposal (FAR 15.507) if its substance is available to the government without restriction from another source, if it closely resembles a pending competitive acquisition requirement or does not demonstrate an innovative and unique method, approach, or concept. Thus, most accepted unsolicited proposals are for research or unusual types of development, while offers to provide routine services or goods do not prosper. Acceptance of an unsolicited proposal must also comply with the Competition in Contracting Act (CICA), which generally requires preparation of a Justification for Other than Full and Open Competition (JOFOC) (FAR 6.302).

NASA currently has two initiatives which will make it easier for private sector organizations to bring their capabilities to bear on NASA's needs:

1. NASA Research Announcements (NRA). The NRA, a form of Broad Agency Announcement as authorized a FAR 6.102, will be used to regularize the process of bringing NASA's research needs to the attention of the public through CBD publication and to provide an equitable and efficient structure for proposal evaluation. While NRA responses are classed as solicited proposals, they retain many of the advantages of unsolicited proposals in that the proposers are free to submit their own unique research proposals to meet the stated NASA need; the resulting competition is one of ideas. Multiple awards under a single NRA may be made. The NRA itself meets the competition requirement of CICA, so individual JOFOCs are not necessary. The NRA is now in use on a trial basis and will be formalized in the NASA FAR Supplement (NFS) in the near future.

2. Unsolicited Proposal Regulations. NFS Subpart 18-15.5, Unsolicited Proposals, is currently being revised to simplify proposal preparation and submission. Additional emphasis is being placed on effective internal proposal handling and control measures including the re-routing of unsolicited proposals directed to the wrong NASA institutional. A revised version of the publicly available brochure, "Guidance for Preparation and Submission of Unsolicited Proposals," is being prepared in conjunction with the revision to the unsolicited proposal regulations. Release of the documents will be coordinated with NRA release. (Bud Maraist)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 37 (Nashville):

The Government procurement process is long and cumbersome. NASA should seek ways to improve this process.

Response:

NASA is constantly seeking ways to improve the procurement process. We strive to improve both the quality of our procurement product (i.e., the solicitations and contracts we produce) as well as to decrease both the complexity and lead time associated with the procurement process. Such improvement must, however, be accomplished within the framework of law, regulation, and oversight under which we operate. That framework is not oriented toward speed or flexibility or even efficiency; the primary thrust of the framework is to safeguard the taxpayers monies and to further the goals established by Congress and the President.

While private industry is free to accomplish its procurement activities in a relatively unfettered manner, government procurement activities are severely constrained. This constraint has always been greater in the government than in private industry, but lately the level of contracting has grown at an ever increasing pace. Examples such as the Competition in Contracting Act, with its stringent requirements for specific approvals for "other than full and open competition," abound in the government contracting world. Social goals unrelated to the product being acquired, as well as funding constraints imposed by budget realities and political considerations, all work together to make the process more complex and time consuming than any of us would like. On the other hand, the record for honesty, integrity, and taxpayer confidence enjoyed by our government procurement personnel compares favorably with that of any other government.

Within NASA, we have undertaken a number of improvements in our procurement organization designed to streamline the procurement process. Recently, we completed the initial implementation of Automated Document Generation system which will significantly reduce the time required to produce a solicitation document. We have accomplished an automated Commerce Business Daily synopsis computer program, which helps speed synopsis input time and cuts delays encountered in getting synopses into the Commerce Business Daily. We have increased dollar thresholds for a variety of reviews accomplished at the Headquarters level, delegating greater authority to our Field Centers and reducing the oversight burden and time delays experienced by those activities. We have initiated automated management information programs which facilitate problem identification and effective management intervention; such effective intervention should improve lead times. We have energized an active in-house management oversight effort through the use of Procurement Surveys professional teams composed of Headquarters and Field Center experts who identify problems experienced by contracting organizations, and who offer assistance to facilitate improvement. One of the items our Surveys will emphasize in their review is lead time improvements. We are currently rewriting our Source Evaluation Board Manual to update and improve the procedures employed in source selection. This document is currently in printing and will become effective October 1, 1988. We are specifically addressing techniques which can be employed to ease the procurement process. Two seminars on NASA Source Selection have been planned to coincide with the release of the Source Evaluation Board Manual. It is hoped that through these seminars, industry will gain a more thorough understanding of these NASA procurement procedures. These seminars will be held in conjunction with the Space Club and will be conducted in Washington, D.C. during October and in Los Angeles during November. Regulations which

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

implement OMB Circular A-109 on Major Systems Acquisitions have also been rewritten. Once these regulations have been coordinated under NASA Headquarters, they will be published and distributed. This revision is intended to improve the procedures currently used by NASA for such major acquisitions. One of the likely improvements which will result is the movement downward of Source Selection Official authority so that greater source selection will occur at Field Center or Associate Administrator level, rather than at the highest levels within the Agency. We have recently begun the use of Business Strategy Panels, high level acquisition reviews accomplished early in a program's development, which identify problems and develop solutions more quickly than before. Results have been encouraging and we intend to increase its use in the future.

While these and other techniques have been developed by NASA over the past few years, we seek to further improve our performance. While we are justifiably proud of the record we have established and our reputation in the procurement field, we are anxious to move ahead in other areas. To that end, we seek input from industry on how to best accomplish such activities. Such input should identify the problem being faced by industry, and should, if possible, make a recommendation for improvement. Unfortunately, we seldom receive such input from industry. Generalized statements that recommend that we "...seek to improve the process..." or which recommend that we "...get Congress to change the procurement laws..." are not as helpful as specific problems or issues which we can act upon. We do not intentionally make the procurement process difficult for private industry, and we will sincerely seek improvement where we are inadvertently causing unnecessary difficulty, but industry must assist us in this process through clear communication of what and how the process should be improved. (Bud Maraist)

Item # 38 (Nashville):

NASA should deal with research funding for industry as a separate unit.

Response:

This issue is very complex due to the involvement of multiple government agencies, educational institutions, and industry. NASA is reviewing the selection process to better understand the reasons for establishing separate industry research funding. (Kathryn Schmoll, Ray Whitten)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 39 (Nashville):

NASA should facilitate participation of small business in the space program.

Response:

NASA is fully supportive of developing small business opportunities in the commercial space program, and important opportunities are visualized for the results of numerous projects funded by NASA in its Small Business Innovation Research Program (SBIR), many of which have significant potential for such applications.

Through SBIR, NASA increases small business participation in all its R&D activities by funding projects selected competitively from the proposals submitted in response to an annual SBIR Program Solicitation. High merit projects are funded through Phase I feasibility demonstrations, then the best ones are funded through Phase II concept development. While specific funding for subsequent commercialization is not possible with SBIR funding, commercialization of federally funded R&D results is an important goal of the legislation authorizing the government to conduct SBIR, and is therefore a consideration in our selection of projects to be funded.

Funding support specifically required for further development and marketing leading to commercial space opportunities for the results of SBIR projects must normally be obtained through private sector sources; nevertheless, NASA desires to assist in this process to the extent it can do so. First, NASA can provide access to space for those businesses requiring such access for research, product development or manufacture, using presently defined arrangements and agreements, and consistent with overall availability and priorities. Second, NASA will assist in the identification of support funding sources by providing information on SBIR projects (both before and after their completion) to private sector organizations, particularly through the Centers for Commercial Development of Space (CCDS) who may be interested in developing or facilitating suitable arrangements with the small business involved. Finally, NASA plans to increase its emphasis on topics in future SBIR Program Solicitations which are conducive to R&D leading to commercial space endeavors for small businesses. The areas in which NASA presently solicits SBIR proposals is as follows:

- 01.00 Aeronautical Propulsion and Power
- 02.00 Aerodynamics and Acoustics
- 03.00 Aircraft Systems, Subsystems, and Operations
- 04.00 Materials and Structures
- 05.00 Teleoperators and Robotics
- 06.00 Computer Sciences and Applications

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

- 07.00 Information Systems and Data Handling
- 08.00 Instrumentation and Sensors
- 09.00 Spacecraft Systems and Subsystems
- 10.00 Space Power
- 11.00 Space Propulsion
- 12.00 Human Habitability and Biology in Space
- 13.00 Quality Assurance, Safety, and Check-Out for
Ground and Space Operations
- 14.00 Satellite and Space Systems Communications
- 15.00 Materials Processing, Microgravity, and Commercial
Applications in Space

(Harry Johnson)

Item # 40 (Nashville):

NASA should establish a big brother program between established aerospace firms and non-aerospace firms.

Response:

NASA does not have a program entitled "Big Brother." However, NASA does advocate and support business relationships between aerospace and non-aerospace firms. NASA's Office of Commercial Programs (OCP) funds aerospace and non-aerospace efforts through its Technology Utilization Program, Small Business Innovation Research (Grant) Program, and Centers for the Commercial Development of Space. Essentially, NASA provides small business offerors with a listing of the prime contractors doing business with the Agency. The listing contains the name of the prime contractor's business liaison, telephone number and address for convenience purposes. Moreover, NASA participates in an extensive outreach program primarily directed toward helping small businesses compete in the present day environment. NASA is an active participant in the Congressionally sponsored Federal Procurement Conferences, which number about 35 each year and sponsor individual conferences and seminars as well. NASA Field Installations, including Ames Research Center, Lewis Research Center and John C. Stennis Space Center, have jointly sponsored procurement conferences with local agencies, area Small Business Administration offices and/or minority Business Opportunity Committees to encourage small business activities with NASA. NASA's ten Industrial Applications Centers (IACs) managed by the Technology Utilization Division, and geographically distributed throughout the fifty states in the U.S., regionally support aerospace and non-aerospace business interests and inquiries. (Code C, Eugene Rosen)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 41 (Nashville):

NASA should create a clearinghouse of potential projects that have been rejected for funding by traditional federal funding avenues. (e.g., OMB turns down a NASA project.) These projects could be pursued by industry.

Response:

The Technology Utilization Division, Office of Commercial Programs, historically receives proposals from NASA Field Centers for potential commercial applications projects involving NASA technology. These projects are reviewed by NASA Headquarters and the mission agency (when appropriate) with respect to the area(s) of commercial and/or institutional applications. If selected for funding, these projects are handled through Headquarters, cognizant NASA Field Center offices and the mission agency associated with the project under an interagency agreement or Memorandum of Understanding. If not selected, the NASA Field Center that proposed the project still has the option of pursuing it through other channels depending on its Center management policy. Technology Utilization (TU) officers at the various NASA Field Centers are often in the best position to recommend such opportunities. Additionally, NASA has a publication entitled "NASA Tech Briefs" which is available to the public upon request--10 volumes annually. This publication contains articles of approximately two pages in length describing NASA research and development accomplishments which are available for technology applications. The Technology Utilization Office at the NASA Scientific and Technical Information Facility (STIF) distributes this publication free upon request. Telephone the Technology Utilization Office at STIF (301) 859-5300 or write to P.O. Box 8757, BWI Airport, MD 20240, to be placed on the mailing list. For further information on the foregoing, contact Henry Clarks at (202) 453-8722. Should the specific interest be in potential space transportation commercialization projects, the Commercial Development Division, Office of Commercial Programs would be the organization with responsibility for pursuing such commercial interests. Accordingly, contact Ray Whitten at (202) 543-1890. (Henry Clarks, Ray Whitten)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

MATERIALS PROCESSING IN SPACE

Item # 42 (Denver):

Can experiments be monitored around the clock?

Response:

This has not been specified yet, but the average monitoring time should be one person, 7 days/week all year. How exactly the time is allocated will be user driven. **(Roger Crouch)**

Item # 43 (Nashville & Denver):

NASA needs to provide reliable and rapid sample retrieval. NASA should have an integrated analytical system on board Space Station Freedom that allows module changes as requirements change.

Response:

The Space Station Freedom Program has the requirement to provide "Laboratory Support Equipment" (LSE) to users for on-board characterization and analysis. The Office of Space Science and Applications (OSSA) recently submitted a change request to the Office of Space Station indicating LSE items required by OSSA, anticipated timeframe of use (Man-tended, Permanently Manned Capability) and specific modifications to the Contract End Item Specification for Space Station provided LSE. Informational copies of the change request were forwarded to the Office of Commercial Programs. For further information on OSSA LSE requirements, contact Dr. Bette Siegel at (202) 453-1689. Specific requirements for Rapid Sample Retrieval are encouraged and inputs concerning the trade-off between Rapid Sample Retrieval and on board characterization should be addressed to Dr. Bette Siegel at (202) 453-1689.

The current approach being taken by the Microgravity Science and Applications Division (MSAD) for experimental hardware planned for flight on Space Station Freedom is modular in nature. Those items not included as part of the LSE (i.e. user unique requirements) will be incorporated as necessary into the modular design of the experimental facilities. Capabilities will be enhanced in response to changing requirements or technology upgrades via changeout of modular subsystems. **(Mary Kicza)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 44 (Nashville):

NASA needs to explain how the concepts and requirements for the modular combustion facility will be included in the MRDB and how the MRDB will be periodically made available for review. [concern over access to MRDB]

Response:

The format of the MRDB is currently being revised to better support the Space Station Freedom design phase. As soon as the new data base is on line, it will be made available. The NASA/Office of Space Science and Applications, Microgravity Science and Applications Division is responsible for providing information on the modular combustion facility to the Office of Space Station Utilization Division for incorporation in the data base. Requests for general MRDB information should be directed to Ms. Mary Jo Smith, NASA Headquarters, Space Station Utilization Division; requests for information concerning the modular combustion facility should be directed to Ms. Mary Kicza, NASA Headquarters, Microgravity Science and Applications Division. (Mary Kicza)

Item # 45 (Nashville):

NASA and industry need more discussion to resolve waste handling and waste segregation for both toxic and nontoxic wastes. [Who has the responsibility?]

Response:

The Space Station Freedom program requirements document (PRD) which is the highest level of requirements for the Space Station, states that "The Space Station program shall provide a capability for safe disposal of all Space Station manned base products". As a result, the program office has embarked on an extended study to (1) understand the scope of necessary disposal and (2) to determine the appropriate means of accomplishing that disposal. User inputs are being collected and analyzed as the basis for the final determination which should occur prior to the Space Station preliminary design review in 1989. NASA encourages industry to provide input on commercial applications for waste management. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 46 (Denver):

Of the 17 experimental racks how many will be used for life sciences and how many for materials processing?

Response:

Caution should be exercised in discussing numbers of racks because each module is still in preliminary design. The U.S. lab will have 30 double racks available for users. The U.S. can also use one half of the double racks available on the ESA and Japanese modules, providing 10 and 6 additional double racks, respectively. Approximately 13 U.S. lab racks will be used for utilities/support equipment. How many racks the user gets depends on what kind of experiments they want to do. If the requirements for the utility racks are low/high there will be more/less space available for payloads. The Office of Space Station is setting up an advisory board to get user input. The Office of Space Science and Applications (OSSA) will decide how many racks go to materials processing and how many go to life sciences. (Richard Halpern)

Item # 47 (Denver):

Is there a current backlog for conducting Space Station Freedom experiments?

Response:

There is no backlog yet, since no specific experiments have been identified to go on-board Space Station Freedom. No announcements have been made for materials processing or life sciences. Only the polar platform and attached payload announcements of opportunity have been made. (Roger Crouch)

Item # 48 (Denver):

Is NASA prepared to consider in its operational planning those unique remote sensing requirements that may make the difference between viable and nonviable commercial operations? An example is the need to use Space Station Freedom power and communications and data resources on a target of opportunity basis thus preempting other planned operations.

Response:

Within its incremental planning, NASA is allowing sufficient time for targets of opportunity. Unlike the shuttle where every minute is planned, the Space Station Freedom utilization percentage will be around 75-80%. This allows sufficient space/time for contingencies, repair, sudden crew changes and targets of opportunity. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 49 (Denver):

What are the proper G-level limitations and quality?

Response:

There have been some studies at the University of Alabama (Huntsville) CCDS to address this question. (Some of the findings were reviewed with viewgraphs). The answer is not clear at this time, however, there is an implication that a free flyer may be needed for containered processing. (Robert Bayuzick, Ray Whitten)

Item # 50 (Denver):

Will U.S. experimenters have access to JEM exposed platform ("back porch")? Access method? Cost?

Response:

U.S. has the rights to access one half of the Japanese "back porch" which will be good for hazardous materials. The Japanese have built the remote manipulator arm to access the porch. Each partner will submit to an international panel a national utilization plan. If partners exceed their allotments, the panel will decide what set of payloads will fit the available resources. The partners will then return to their national agencies and show the results and then bargain for a final decision. (Richard Halpern)

Item # 51 (Denver):

What are the ground-rules for use of the ESA free-flyer?

Response:

The ESA man-tended free-flyer is being built by and belongs to ESA. Any services required for the flyer will come from the ESA shares of Space Station Freedom. The U.S. has the right to access 25% of the flyer for which use we will pay ESA. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 52 (Denver):

Should a company's materials carry a military security classification, and if so, what sort of difficulties are presented?

Response:

Each of the Space Station partners is obligated to use the Space Station only for peaceful purposes, in accordance with international law. Each Space Station partner who provides a Space Station element is required to determine that a contemplated use of the partner's element is for peaceful purposes. If materials are classified by the United States, the United States may nevertheless determine that the proposed use in the U.S. laboratory or element is for peaceful purposes, in accordance with international law if the appropriate factual circumstances are present. (Robert J. Wojtal)

Item # 53 (Denver):

There is current debate in NASA about the importance of electrophoresis. In essence, NASA currently cannot predict the importance of electrophoresis and people's interest in it. What is the NASA position on electrophoresis experimentation and supporting equipment development?

Response:

There is no question as to the importance of electrophoresis. Various electrophoretic processes have been extremely productive over the years. The problem lies in that new techniques and applications are constantly being developed at a pace which is frequently incompatible with the time required to develop and flight qualify hardware for space research. By the time hardware is developed and flown, the technology and/or the application can be outdated.

NASA's Microgravity Science and Applications Division (Code EN) is not currently funding the flight hardware development of electrophoresis equipment. However, U.S. investigators have been offered the opportunity to use equipment developed by NASDA and CNES on the International Microgravity Laboratory Flights. Code EN continues to support ground-based research in cell separation techniques through Marshall Space Flight Center's Materials Science Laboratory and the University of Arizona's Center for Separation Science. (Roger Crouch)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 54 (Denver):

Will characterization facilities be needed on-board Space Station Freedom for metals and alloys?

Response:

NASA is not ready to say "no" at this point. Several factors need to be addressed before coming to a conclusion on this, including: the availability of crew time, the relative science priority, the availability of rapid sample return, the available telescience capabilities, and the available characterization technology. These issues are currently being addressed, but until they are resolved, we feel it's imprudent to say that no characterization facilities for metals and alloys will be needed -- especially since we are talking about a space station with a proposed 30-year lifetime. (Roger Crouch)

Item # 55 (Denver):

There is a trade-off of quick sample return vs. on orbit characterization. Are you willing to let the crew do sample characterization?

Response:

The Microgravity Science and Applications Division is looking at on-board characterization on Space Station Freedom, and believes that some on-board characterization in some disciplines may be essential. Over the next several years, it's assumed that characterization capabilities will be expanded as technology is advanced, which should ultimately make on-board characterization more and more feasible. (Roger Crouch)

Item # 56 (Denver):

The degree of on-orbit characterization of materials in Space Station Freedom depends strongly on the timeliness of sample return to Earth. The longer the delay, the more one should provide some characterization in Space Station Freedom to support experimentation and re-processing of samples. Five questions pertaining to this topic are:

- a: What materials characterization capabilities is NASA planning to provide on Space Station Freedom?
- b: Since a trade-off is implied, should researchers be asked "Would you rather use rack space for characterization equipment or for payloads?"
- c: What are the possibilities for characterization by remote control from the ground versus crew training to accomplish this work in orbit?

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

- d: With a laboratory in place some 2 years before a manned presence, shouldn't there be some provision for telescience to support experimentation.
- e: When will NASA establish policies and procedures for characterization, for sample return, and for sample replenishment back up to station?

Response:

- a: A Change Request has been formally submitted to the Office of Space Station from the Office of Space Science and Applications. Our understanding is that the proposed request is currently under evaluation by Space Station Work Package 01. A technical audit of the LSE requirements is currently being planned.
- b: The decision concerning on-board characterization involves more than a tradeoff between rack space for characterization equipment vs. rack space for payloads. Also involved is the timeliness of sample return, the ability to retain sample integrity through the transport-to-ground process, the availability and skill level of crew to perform on-board characterization, and the availability of adequate telescience capabilities to allow ground investigator interaction with the crew. All of these issues must be addressed, and certainly researchers and science discipline working groups (advisory groups) should be consulted as part of the decision making process.
- c: The ability to remotely characterize samples from the ground will depend on station design and on technology and telescience advancements over the next several years. The Office of Space Science and Applications (OSSA) has submitted change requests to the Office of Space Station addressing requirements for station lab support equipment and on-board data transfer, storage and processing. Telescience testbeds have been initiated to better understand user data latency requirements, and to determine the minimum amount of data required to allow for research to be conducted remotely. Advanced technology development efforts should enhance the possibilities for remote characterization. However, this would not entirely eliminate the need for crew to support the sample characterization efforts. Its expected that ground researchers and the crew would work as a team to accomplish research goals.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

- d: Yes, and as mentioned above, efforts are underway to optimize capabilities.
- e. This question needs to be addressed jointly by the Office of Space Station and the various user organizations.

(Roger Crouch)

Item # 57 (Denver):

Some critics of Space Station Freedom refer to the program as a "big science" project, like the superconducting supercollider or fusion energy, which drains funds away from "small science" activities. Supporters of Space Station Freedom might respond that the Station is really the infrastructure with which to conduct "small science" research. How does NASA respond to this "big science" criticism?

Response:

Research in space is unquestionably an expensive proposition. NASA's goals include the establishment of a manned presence in space, and OSSA -- through the Life Sciences and Microgravity Sciences and Applications Divisions' research programs -- intends to utilize this capability to perform research addressing questions which cannot be addressed in any other arena. The goal of these programs is to assure that the quality of the science will eventually support the large investment in this new research capability. (Roger Crouch)

Item # 58 (Nashville):

NASA should sponsor precursor polymer experiments in the following areas :

- Measurements of extensional viscosity in microgravity;
- Spinoidal decompositions;
- Copolymerization of monomers with varying reactivity ratios; and
- Effects of microgravity on polymer foam production.

Response:

NASA believes that polymer experiments are important and have far-reaching potential to industry. NASA is willing to sponsor polymer experiments consistent with agency policy. We are currently reviewing proposals for polymer experimentation. NASA is willing to review all industry or university proposals. New proposals should be addressed to Director, NASA Office of Space Science and Applications. (Roger Crouch)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 59 (Nashville):

NASA should fly the existing MPS polymer experiments.

Response:

Allocation of payload flight space on the Shuttle for polymer experiments will be consistent with the space available for experiment and corresponding flight priorities. Flight scheduling is based upon qualitative assessment of the proposed experiments. Currently five (5) experiments involving polymers are under development. They are non-linear optical organic crystals, non-linear optical monomer thin films, electrodeposition, organic separation, and organic and polymer processing. The first four (4) are being developed under the auspices of the University of Alabama (Huntsville) Center for Commercial Development of Space and scheduled to fly on the initial flight in the new United States Microgravity Laboratory (USML-1) in March 1992. The organic and polymer processing experiment is under development by the 3M Corporation and is scheduled to fly on the Orbiter middeck prior to USML-1. New proposals will be manifested as soon as possible in accordance with the NASA Manifest policy. (James McGuire)

Item # 60 (Nashville):

The fluid physics group should do non-Newtonian fluids experiments to study drop break-up and drop coalescence.

Response:

NASA recognizes the importance of drop break-up and drop coalescence experiments. Hardware to conduct these experiments is under development and the experiments are scheduled during a USML mission to be conducted in early 1992. (Robert Schmitz)

Item # 61 (Nashville):

NASA should place a high temperature (>2000oC) furnace facility on-board Space Station Freedom for metals and alloys work.

Response:

A Space Station Freedom furnace facility capable of conducting experiments above 2000oC will be available with the completion of the man-tended laboratory. The furnace is currently part of the microgravity Space Station Freedom plan. (Mary Kicza)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 62 (Nashville):

NASA should perform research in the following areas:

- porous foam - hollow spheres
- composite alloys - wetting
- precious metals catalysts
- metals and alloys characterization

Response:

NASA recognizes the importance of research in these areas and welcomes proposals from industry for these and other MPS research areas. Currently NASA is conducting research in a number of areas described below.

Porous Foam - Hollow spheres research is currently being conducted at JPL. The principal investigator is Donald Germann who can be reached at (818) 354-2812.

Composite Alloys - Wetting research is being conducted by Julian Szekely of MIT who can be reached at (617) 253-3236.

Precious Metals Catalysts - Research has primarily been conducted through the CCDS participants, including the Center for Advanced Materials, Battelle Columbus Laboratories, and the Center for Development of Commercial Crystal Growth in Space, Clarkson University.

Several studies are currently being conducted in the metals and alloys characterization area. Dr. John Margrave of Rice University is performing research on thermophysical property measurements in containerless facilities and can be reached at (713) 527-8101. A proposal on melt purification of indium has been submitted to NASA for review. Mark Lee - NASA Headquarters (202) 453-1490; Jim Allen - Jet Propulsion Laboratory (818) 354-4321; and Martin Glicksman - Rensselaer Polytechnic Institute (518) 276-6721 are all conducting research in the metals and alloys characterization area.

(Roger Crouch)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 63 (Nashville):

The Biotechnology panel recommends placing more emphasis on meeting requirements rather than individual facilities, especially those related to:

- the study of macromolecular crystallization aggregation, synthesis, and assembly
- cellular level studies: secretion, multiplication, interaction, and differentiation
- separation, purification, and fractionation of particles

Response:

The 1988 Space Station Freedom Workshop that was held in Denver, Colorado was a forum for industry to identify their biotechnology requirements. Two commercial application areas were established to address the above research and development activities; Materials Processing in Space and Life Sciences. NASA officials were present at each of these working groups to address current Freedom configuration, detailed technical issues, and policy issues. **(Richard Halpern)**

Item # 64 (Nashville):

NASA should include provisions for metals combustion in the list of reference experiments currently being used.

Response:

NASA Lewis Research Center is currently developing a conceptual design of the Modular Combustion Facility (MCF) for use in the U.S. Laboratory Module of the Space Station Freedom. Metals Combustion is one of the six reference experiments being used to determine the envelope of combustion user requirements. The source of Metals Combustion technical requirements is Dr. Frank Benz of the NASA White Sands Test Facility. **(Kurt Sacksteder)**

Item # 65 (Nashville):

NASA should support development of recycling technology such as "membrane separation technology."

Response:

No current research is being conducted in this area; however, NASA is willing to review proposals from industry interested in membrane separation technology. Taylor Wang of JPL is looking at spherical shells that can encapsulate cells. He can be contacted at (818) 354-6331. **(Code E)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 66 (Nashville):

NASA needs to provide a substantial data base of low-gravity combustion phenomena to increase understanding of these phenomena and to inspire innovative ideas.

Response:

Each Microgravity Working Group Discipline is preparing an overview document which will summarize research results and provide a rationale for future research direction. Six such discipline documents will be published as illustrated brochures.

In addition, the Universities Space Research Association (USRA) has been designing a data base to make the results of microgravity research timely, widely available, and easily accessible. (Steve Speech)

Item # 67 (Nashville):

NASA should conduct basic research in glass fiber pulling. Industrial interest in glass fiber pulling cannot realistically be expected until some basic research has been conducted and some success is demonstrated.

Response:

NASA has discussed funding glass fiber pulling for quite some time; however, the primary issue is a lack of defined technology to do this research in space. NASA is willing to review proposals in this area and fund the basic research. Dick Parker of Lewis Research Center is interested in glass fiber pulling and can be reached at (216) 433-4000. (Roger Crouch)

Item # 68 (Nashville):

NASA should expand industry input in the glass and ceramic area by sending a mailing of current research to industry and initiating a follow-up program.

Response:

A follow-up program is needed to help expand industry input for glass and ceramic research.

The goal of glass and ceramics research is to use microgravity and modeling studies to gain an improved scientific understanding of glass formation and the processing and ultimate properties of vitreous and crystalline ceramics.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Microgravity's reduction in buoyancy and gravity-induced convection makes possible the investigation of high temperature melts in a containerless manner and the potential creation of glasses and ceramics that are ultrapure chemically and that have unique compositions, microstructures, and properties. Reduced gravity also makes it possible to isolate the effects of weak forces, such as surface and interfacial phenomena, so that they can be studied independently of gravity-dependent body forces.

The knowledge gained from research in space will lead to more efficient and novel processing methods on earth and to a firmer understanding of the ultimate limits of the engineering performance of glass and ceramic materials. The space exploration program itself will benefit from a science base enabling exploitation of in-space resource.

There is a substantial amount of ongoing activity in the area of glass formation, nucleation, and crystallization. Research on these topics is being pursued by Dr. E.C. Ethridge of Marshall Space Flight Center; Professor D.E. Day at the University of Missouri-Rolla; Professor R. Doremus of Rensselaer-Polytechnic Institute; and Professor M.C. Weinberg of the University of Arizona. A common objective of these containerless processing studies is to improve our understanding of nucleation and crystallization processes which occur on earth and to use that knowledge for designing space experiments which could lead to the formation of novel glasses, e.g., unique optical properties and superconducting glasses. Several compositions being studied are of particular interest because of their potential applications in optical and microelectronic devices.

Investigations are being pursued involving the crystallization behavior of fluoride glasses which have excellent infrared transmission, and are prime candidates for ultra-low-loss optical fibers (long distance telecommunications applications such as undersea lines as required by the Navy). Also, the glass forming ability and crystallization of lead borate glasses are being studied since these compositions have application as solder glasses in the sealing of integrated circuit chips and self-luminous plasma display devices. Glass forming ability for calcia-gallia and other compositions with interesting index of refraction-dispersion combinations (required for advanced optical devices) are also being investigated.

Containerless experimentation may be employed to perform high temperature property measurements on materials which would react and/or be contaminated by a container. Research in this area is being pursued by Drs. P.C. Nordine and R.A. Schiffman at the Midwest Research Institute and Professor J. Margrave of Rice University. Ground-based levitation systems are being utilized to obtain preliminary data on systems of interest. However, due to various restrictions of ground-based equipment (such as difficulties in levitating and manipulating certain molten materials), space experiments will be required for satisfactory exploration of the high temperature thermodynamic properties of these materials.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Optical glasses and many other glasses with high technology applications must be defect-free to be employable. However, during the glassmaking process gas bubbles are invariably generated in the molten glass. On earth, a common mechanism for bubble elimination is a buoyant microgravity environment. Thus, alternative means must be found to eliminate bubbles from glass melts in space. This problem is being addressed by Professor R.S. Subramanian of Clarkson University and Professor M.C. Weinberg of the University of Arizona. On the other hand, microgravity allows for the performance of a number of bubble related investigations in which gravity is a complicating factor. For example, Dr. P. Hrma, of Case Western Reserve University, is studying the behavior of foams. The production of foams entails a very complex process, and significant simplifications might be evolved by examination of this process in space where gravitational effects would be suppressed. A second illustration is given by the fabrication of microballons used to encapsulate the fuel for nuclear fusion reactions, and thus must meet a number of stringent requirements concerning dimensionality and surface smoothness. Microgravity experimentation could help in understanding the mechanism by which microballons are formed. Research in this area is being pursued by Drs. Taylor Wang, Mark Lee, and others at the Jet Propulsion Laboratory. In addition, the shaping and fabrication of large (several millimeters) glass macroballons for initial confinement fusion targets is being investigated by Professor D.E. Day at the University of Missouri-Rolla in collaboration with Los Alamos National Laboratory.

Work at the Lewis Research Center has also been initiated in the area of phase separation in glasses by Mark J. Hyatt. The objective of this work is to study the effects of space processing on phase separating glasses. This could lead to glasses with unique microstructures and properties, and also furnish basic understanding of a process affecting many glass forming systems. The approach uses a convenient model system to explore the phase separation process under a range of gravity conditions, using ground-based facilities. The information thus gained will be used to model the phase separation process in a suitable glass system. Space experiments would then be carried out using this glass system, and the results compared with those predicted by the developed model of phase separation. Currently, investigations are underway to select a suitable system for the ground-based modeling studies.

Ceramics-related research has had less program emphasis than glass related research and it is only during the past few years that several ground-based efforts have been initiated.

Professor James D. Cawley of the Ohio State University is studying the effects of microgravity on the agglomeration of powders in dilute aqueous solution in the research project entitled "Study of Powder Agglomeration in a Microgravity Environment." This work will result in an improved theoretical understanding of the agglomeration of powders that will be extremely beneficial to the materials industry. Current models of the agglomeration process are restricted to totally diffusing transport of power particles. A microgravity environment is therefore desirable because thermal convection currents and particle settling are eliminated, and particle motion is purely by diffusion. The research will involve the selection and characterization of three representative types of powder suspensions and the development of a light scattering analysis technique to probe the structure of the agglomerates. The results will be compared to a numerical computer model.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Professor William Russel and Dr. P.G. Debenedetti of Princeton are working on a program entitled "Disorder-Order Transitions in Colloidal Suspensions: Computer Simulations and Experimental Observations." The work combines theoretical and experimental studies of the dynamics of disorder-order phase transitions in concentrated colloidal systems. The theoretical aspect involves the use of Brownian dynamics computer simulations to study the irreversible process whereby a disordered, concentrated colloidal dispersion relaxes by forming an ordered structure. In addition to this modeling, experiments with well characterized particles (silica spheres) under conditions similar to those being simulated will be conducted to test the influence of gravitational forces upon the phase transition. These experiments, which will involve the observation of the phase transition for one or more model systems, will lead to light scattering work on earth or the design of experiments to be performed in space. The work is related to the processing of ceramics because the dynamics of the phase transitions in colloidal dispersions are fundamentally important in determining the ultimate morphology of many densely packed systems formed in processes of technological relevance (sedimentation, ultrafiltration, slip casting).

The aim of the programs completed by Drs. Robert G. Behrens and Steven M. Valone, Los Alamos National Laboratory, was to determine the role of gravity in the formation of ceramics and alloys via the self-propagating high-temperature synthesis process. They examined the reactive fluid flow aspects of condensed phase combustion processes at microscopic and atomic levels via wetting experiments and numerical simulations. Wetting experiments of titanium on graphite have been conducted and photographically monitored. Numerical simulations of wetting, spreading, bubble entrapment, and break-up have been carried out. Based on results to date, the various studies show the role of microgravity is masked by wetting phenomena.

The topics of glass formation, glass containerless processing, glass firing, and glass thermophysical property measurements that are in or near flight status will hopefully be accelerated with resumption of flight experiments. Current topics such as particle sedimentation and agglomeration, glass foams, and glass phase separation appear to warrant continued support and consideration for eventual flight status.

Gas phase processing of glasses and ceramics has been employed for fabricating low-loss optical fibers and for producing microscale ceramic particulates which can be formed at low temperatures to produce extremely strong materials. Basic understanding of the science of several of the individual steps in these processes is lacking. Because this processing entails flows of hot gasses with large temperature and concentration differences, convective flows may be in evidence, which could warrant microgravity experimentation.

Glass making refers to the melting, chemical reactions, and mixing involved in converting crystalline powders into molten glasses via heating. Convective mixing, which can be extremely important in homogenizing a glass melt on earth, will be absent in space. Questions arise concerning the ability to produce compositionally uniform glasses in microgravity, particularly in instances where stirring is precluded because contact with foreign bodies during processing is forbidden. Research addressing this issue is specially important if glassy materials are to be fabricated in space for use in space.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Joining is the process by which glasses and ceramics are bonded to metals, polymers, composites, or each other. Gravity can affect the flow characteristics of the important liquid phases produced during joining and thus invalidate techniques that are successful in a gravity environment. Thus, joining of in-space structures may be an important area for future research and technology development.

In microgravity, especially in containerless experiments, surface tension and interfacial phenomena can be studied and utilized unimpeded. The properties of surface skins should be investigated, including the segregation and enrichment of components which substantially change the surface tension and properties of melts. Surface tension driven flows could be used for mixing and bubble elimination of molten glasses and ceramics.

All processes to produce glass or ceramic fibers involve the flow and subsequent "stiffening" of a liquid phase. Typically, drawing of glass fibers is done from a fairly viscous molten liquid; hence, gravity has little influence upon the fluid flow. For fibers drawn from a fluid ceramics, the situation could be quite different and gravitational effects could be significant. Gaining a firm understanding of the phenomena involved is extremely important.

The formation of glasses is hindered not only by the nucleation and growth of crystals, but also by liquid-liquid and glass-in-glass phase separation. Phase separation is the process whereby a homogeneous mixture composed of two liquids separates into two distinct phases. On Earth, complete separation of the phases may occur. However, in space, sedimentation and agglomeration will be suppressed, and new glass or ceramic composite microstructures with useful properties might be achieved. The suppression of sedimentation in microgravity could result in a more uniform array of particulates and a broader range of particle sizes. Such multiphasic dispersions or composites can serve as transducers of mechanical, magnetic, optical, electrostatic, or chemical stimuli as well as structural materials.

Ceramics are composed of crystals or grains of ionic or covalent solids, that are one-tenth to one-hundred microns in size. Many ceramic properties -- light transmission, index of refraction, magnetization, dielectric constant, elastic modulus--are determined directly as the sum of these properties of the individual grains. However, in most solids, these properties vary with the direction in the crystal with respect to its crystallographic axes, i.e., the crystals are anisotropic. Further, the properties of the bulk (polycrystalline) body depend on whether the axes of the individual crystals are aligned, i.e., show some preferred orientation. The presence of a substantial orientation texture may yield unique properties and become an essential objective of ceramic processing. For example, ceramic superconductors need texture to carry high currents. One way to achieve texture in ceramic magnets is to impose a strong field during consolidation of the starting powders to align the individual grains. Once orientation is achieved, further processing, (compaction, sintering, annealing, etc.) does not destroy it. In nonmagnetic materials, however, the task of achieving texture is much more difficult and the procedures are yet to be determined. Gravitational effects in larger particles may entirely override the extremely small torque in nonmagnetic materials. Consequently, microgravity may be the only means to obtain the desired texture in these cases.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Finally in support of terrestrial and microgravity science, fundamental transport property data are needed. Gravity can affect transport phenomena such as diffusion and heat transfer, which play a fundamental role in a large variety of processing operations. The overall difference occurring in microgravity needs to be established via precise physical property measurements that are available in a microgravity environment.

Progress in glass and ceramics technology is vital to the nation's competitiveness across a broad range of technologies including solid-state devices, ceramics for heat engines, and high-temperature superconductors.

Expansion and acceleration of the field of glass and ceramics microgravity research through resumption of Shuttle flights and the Space Station Freedom will contribute in tangible ways by means of benchmark space fabricated materials and less tangible, but equally important, contributions resulting from new knowledge and improved models.

NASA will investigate means of facilitating dissemination and follow-up activity for glass and ceramic research. (Steve Speech)

Item # 69 (Nashville):

A dedicated material science glove box is a "wished-for" entity on Space Station Freedom. The powder press is not important in the early stages.

Response:

The dedicated material science glove box (for MPS experimentation) is currently planned for the Space Station Freedom lab module and will be available with initial station occupation. (Robert Schmitz)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 70 (Nashville):

The NASA fluid physics discipline team should encompass chemical vapor deposition (CVD) and sputtering (coating studies) aspects of microgravity research in their work.

Response: NASA Code E is currently funding chemical vapor deposition research and Code C is funding MOCVD research. Discussions are currently taking place with the Japanese on a cooperative study effort. Diamond CVD studies funded by NASA Code R are also being conducted by Bruce Banks at Lewis Research Center, (216) 433-2308 .

Code E is currently not funding any sputtering (coating studies) research, but would welcome any experimental proposals in this area as well as chemical vapor deposition. **(Roger Crouch)**

Item # 71 (Nashville):

NASA should investigate large scale space production of glass and polymer spheres.

Response:

NASA encourages industry participation in investigating larger scale production of glass and polymer spheres. There are many possible uses for glass and polymers. These uses must first be identified before large scale production can begin. **(Mark Lee)**

Item # 72 (Nashville):

NASA should develop a Space Ultra-vacuum Research Facility (SURF).

Response:

The SURF is an element included in the Headquarters Microgravity Program's Strategic Plan; SURF funding and utilization requirements are being studied. Currently, there is an effort underway at the Space Vacuum Epitaxy Center, University of Houston, under a grant sponsored by the Office of Commercial Programs' Centers for the Commercial Development of Space (CCDS), to establish an experimental facility for wake-vacuum experiments from the Shuttle. This effort seeks interest and support from commercial users who wish to explore the benefits of the space vacuum for possible applications to semi-conductor and other materials. **(Robert Schmitz, Charles Baugher)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 73 (Nashville):

NASA should create a National Special Characterization Facility.

Response:

NASA would be interested in examining the relative merit of a National Special Characterization Facility. To do this, NASA will require additional information on the type of equipment required, location, and other amplifying details. **(Robert Schmitz)**

Item # 74 (Nashville):

NASA should review and improve current peer review procedures.

Response:

MSAD has significantly changed its review process and is still studying ways to improve the efficiency and validity of all reviews. NASA encourages industry and government agency suggestions to improve this process. **(Roger Crouch)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

EARTH AND OCEAN OBSERVATIONS

Item # 75 (Denver):

Is the Announcement of Opportunity for the Polar Platform still open?

Response:

The announcement was closed during July 1988, and NASA selection occurred February 15, 1989. NASA chose 24 investigations from 455 proposals to be part of its Earth Observing System. (Wes Huntress)

Item # 76 (Denver):

What opportunities will exist for commercially developed and operated sensors to fly on the Space Station Freedom Polar Platforms (if not on the first platform, on subsequent platforms)?

Response:

Each NASA user office (OSSA, OAST, and OCP) will share the allocated resources of the U.S. and ESA polar platforms. Commercial payloads must be defined, submitted, and sponsored through NASA's OCP. (David Brannon)

Item # 77 (Denver):

Who determines the priority of an Earth Observing Workstation (located in the Resource Node) in competition with other experiments/hardware for space, physical location, power, etc.?

Response:

The SSP Utilization and Operations Program Group, User Accommodations Panel at Level II receives information from studies and NASA code responses to determine the priority, compatibility, and impact of resource-competing payloads. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 78 (Nashville):

NASA should incorporate several key requirements for commercial users into the specifications of mission parameters. These issues include data rates and priorities of data rates from the platforms, repair priorities and schedules, provisions for direct data downlink, and information on additional commercial opportunities.

Response:

With the exception of priorities, provision for data exists in the Mission Requirements Data Base (MRDB). Priorities will be addressed and negotiated individually for each mission. However, the Space Station Freedom should have provisions for various priorities/response times with associated cost schedules. (David Brannon)

Item # 79 (Denver):

What is the status of the optical quality windows for earth viewing?

Response:

We have a requirement in consideration to put one on the station. (David Brannon)

Item # 80 (Denver):

Has any other service other than the U.S. Navy contributed resources for the optical quality window or any other earth observing related effort?

Response:

To date, no service has contributed resources for the optical quality windows or any other earth observing related effort. The U.S. Navy has expressed possible interest in utilizing windows and other observation capabilities, but has not yet formally supported efforts in these areas. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 81 (Denver):

Do any of Freedom's international partners have plans for Earth viewing facilities? If so, are there any restrictions/limitations on proposing use of their facilities by United States commercial interests?

Response:

All international partners have plans for Earth viewing facilities. U.S. companies must contact the foreign partner directly. Each partner will independently decide on usage criteria and pricing policy. (Richard Halpern)

Item # 82 (Denver):

Is there a manned earth viewing system with a tracking telescope which would protrude out being looked at for Space Station Freedom?

Response:

No. There are no current plans for a Manned Earth Viewing System with a tracking telescope. (David Brannon)

Item # 83 (Denver):

Presentations on existing and future platforms did not include MIR - what are we doing to use the lessons learned by the Soviets in our Space Station Freedom planning?

Response:

Soviet experiences in earth observations from the MIR involve a great deal of manned observations. The Space Station Freedom will also have the necessary accommodations for manned observations, including: cameras, windows, attached sensors, and workstations. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 84 (Denver):

What storage space will be available on-board Space Station Freedom to facilitate on hand supplies of film, new and exposed, and spare parts, if required?

Response:

There is space allocated for storage of film and spare parts in the Laboratory and Logistics module. (David Brannon)

Item # 85 (Denver):

Will any station on-board the Space Station Freedom have the capability to perform digital image processing? Can on-board storage and manipulation of imagery be achieved if needed?

Response:

The attached payload support workstation will have the capability to perform digital image processing. On-board storage and manipulation of imagery can be achieved if needed. (David Brannon)

Item # 86 (Nashville):

NASA should revise the MRDB for the LFC mission time frame and to correct spatial resolution from 14 x 25m to a 10 x 10m manageable size.

Response:

NASA does not plan to change the MRDB resolution description for LFC. The Large Format Camera is an existing instrument. Its resolution is determined by optical design, altitude, platform stability, and film characteristics. The numbers specified are for a defined set of conditions which can be extrapolated to other working conditions and, therefore, provide the information requested. Changes to the LFC to meet requested resolution could require major modifications resulting in additional cost. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 87 (Nashville):

NASA should revise the MRDB to include an attachment for a pointable LFC mount.

Response:

NASA is willing to do this if resources are made available. If industry builds and uses a pointable LFC mount, NASA is willing to undertake the recommendation from industry in the interim. (Shelby Tilford)

Item # 88 (Denver):

Besides the Large Format Camera, what other sensors have been identified for the platform? How many mounting stations will be available? What is maximum data transfer rate that can be supported from the remote sensing platform? Have panoramic cameras been considered?

Response:

Besides the LFC, a Synthetic Aperture Radar (SAR) has been identified as a type of sensor that could utilize the Earth Observation Accommodation Facility. The initial concepts for the Facility has three mounting decks for numerous sensors. The maximum data transfer rate is 1 gb. Panoramic cameras will be considered if proposed by industry. (David Brannon)

Item # 89 (Denver):

Kinetic energy isolation is an important consideration regarding the location of the sensor platform. What are the ambient sources of vibration that could affect the sensor platform?

Response:

The ambient sources of vibration will depend on the location of the sensor platform. The current vibration requirement baselined in the Program Requirements Document (PRD) states that all user locations (internal and external) shall have acceleration levels not exceeding 10 micro g at frequencies less than or equal to 0.03 Hz for continuous periods of at least 30 days. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 90 (Denver):

Has the final location of the remote sensing facility been firmly established? What will the inherent kinetic energy, outgassing, glare, and other sources of noise be at this location?

Response:

The facility will be located on an APAE underneath the truss. No definite location has been established, but the fourth truss bay on the starboard side is preferred for the Facility. The interfering physics and phenomenon of the Freedom Station are not quantified and are under study. (David Brannon)

Item # 91 (Denver):

Based upon the sensor suite, which will change as new experimental sensors are introduced, some routine servicing by man will be required. This includes actually mounting sensors, film loading, and unloading, packaging exposed film for return to earth, etc...How much labor is available on a weekly basis to support these type of tasks?

Response:

The Program Requirements Document (PRD) for crew time states that the total crew time available to users during nominal operations when the full crew of 8 is on board shall be 6 equivalent crew members split between intravehicular activity (IVA) and extravehicular activity (EVA). (Richard Halpern)

Item # 92 (Denver):

What is the relationship between Code EI Earth Observing System (EOS) and the earth observing activities/capabilities being developed for the main Space Station Freedom platform?

Response:

The scientific missions to be developed by Code EM for the polar platform and the manned base are intended to support the EOS. Both polar orbit and equatorial orbit sensor data will contribute to the global environment monitoring objective of EOS. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 93 (Nashville):

NASA should support COMM 1014 (Remote Sensing Test , Development, and Verification Facility) and ensure that it has a pointing capability.

Response:

A feasibility and concept development study of COMM 1014 is under way and will be completed during FY'89. Pointing capability, among other user requirements has been incorporated in the concept study. Further refinements of the COMM 1014 is proposed and funded for FY'89. (David Brannon)

Item # 94 (Denver):

We can increase the commercial market for the image products from the platform if sensors can be pointed off nadir to take oblique photography. This would provide for varying quality coverage beyond 28 degrees latitudes. To what degree of accuracy will pointing be achievable; and will this capability permit dwelling on given targets?

Response:

Pointing can be achieved through the SSP payload pointing system to a design accuracy of 40 seconds of arc and stable to 5 seconds of arc over a 10 second period. User provided pointing systems may also be used to reduce cost and improve performance. Target dwell is possible. (David Brannon)

Item # 95 (Denver):

Has serious and specific consideration been given, in the course of Space Station Freedom earth observing planning activities, to the possibility that earth observation from the main Space Station Freedom platform is not a commercially viable endeavor? If so, what were the conclusions, and what was the rationale behind those conclusions?

Response:

Only industry can consider the commercial viability of Space Station Freedom. It is not the purpose of the SSP to make judgments on the possible success of commercial endeavors on Space Station Freedom. It is the SSP's function to plan for all possible users of the Facility--whether they are commercial or scientific. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 96 (Denver):

The specifications for jitter for the payload pointing system is 15 arc sec/sec, with an envelope of plus/minus 30 arc seconds over a 30-minute period. Is there any information about the functional nature of the jitter, or is it totally random?

Response:

Studies have been commissioned by the SSP Level II, Utilization and Operations Program Group to characterize all motion within the Freedom Station environment. Results should be known by November, 1989. (David Brannon)

Item # 97 (Denver):

For accurate positioning, photogrammeterists will require stellar camera data taken from the platform. Are there any plans for a stellar camera suite?

Response:

There are not any plans for a stellar camera suite. If the photogrammeterists' experiment is in a fixed position on the Space Station Freedom structure (i.e., no payload pointing system), the Station's orbital ephemeris data, altitude reference data, and time data may be used for positioning solutions. (David Brannon)

Item # 98 (Denver):

EOS data will have interest to the general user community. How will data be transferred to the general user community beyond research?

Response:

NASA intends to comply with Sections 502 and 503 of the Land Remote Sensing Commercialization Act which states:

Use of Experimental Data

Sec. 502. Data gathered in Federal experimental remote-sensing space programs may be used in related research and development programs funded by the Federal Government (including applications programs) and cooperative research programs, but not for commercial uses or in competition with private sector activities, except pursuant to section 503.

Sale of Experimental Data

Sec. 503. Data gathered in Federal experimental remote-sensing space programs may be

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

sold en bloc through a competitive process (consistent with national security interests and international obligations of the United States and in accordance with section 607) to any United States entity which will market the data on a nondiscriminatory basis.

Under these provisions, it is NASA's intention to provide EOS data to the general user community to be used in related research and development programs. The only cost incurred will be for reproduction and data transmittal. **(David Brannon)**

Item # 99 (Denver):

If I can get EOS multisensor data for free - or at nominal cost - why should I ever buy commercial data; and, why should industry invest in commercial sensor systems?

Response:

1) The data may be held back by the principle investigator (PI) for an indefinite amount of time; 2) The PI may only release a portion of the data; 3) Many EOS sensors are experimental and many are not permanent; thus, the EOS sensor data would not be a continuous, consistent or long-term image source; and 4) Commercial sensors may be designed and operated specifically to meet commercial users' needs; 5) EOS data can only be used in related research and development programs as outlined in Sections 502 and 503 of the Land Remote Sensing Commercialization Act. See Item #98. **(David Brannon)**

Item # 100 (Denver):

What is the response time for receiving data from the polar platform?

Response:

The time frequency bus on the polar platform offers the users accurate time information of approximately 10 microseconds. **(Richard Halpern)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 101 (Denver):

What provisions are being made for timely commercial user access to time-sensitive (commercial value) sensor on the Space Station Freedom Polar Platform?

Response:

Sensors on the Polar Platform will be scientific and non-commercial. No distribution schedules have been set. Commercial data users should inform NASA OSSA of their intentions to use time-sensitive data. The availability of NASA funded payload data is addressed in Item #98. (David Brannon)

Item # 102 (Denver):

Who will set the priorities on allocating communications through the TDRS link when you have a conflict with that resource?

Response:

Space Station Freedom Control. Of the 300 megabytes, approximately 50 megabytes will be reserved for station and for video. Priority would be assigned by the Payload Operations Integrations Center out of the 250 megabytes available. (David Brannon)

Item # 103 (Denver):

What provisions exist to accommodate excessive data transmission demand?

Response:

Some data may be temporarily stored on manned base mass storage devices until transmission can be accomplished. Additionally, on-board data processing and data compression may reduce the amount of data to be transmitted. User-provided antennae are also permitted to transmit data. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 104 (Denver):

How will TDMS 2262 and TDMX 2261 be prioritized with other experiments/investigations?

Response:

They must receive sustained advocacy by the OAST and promoted as a planned mission. Intra-NASA allotments and intra-Office priorities will dictate which missions are priorities. (David Brannon)

Item # 105 (Denver):

How will the contrasting protocols of proprietary data rights and non-discriminatory access to remotely sensed data be addressed by Space Station Freedom policy makers?

Response:

Proprietary data rights for privately financed U.S. payloads will be honored. Proprietary data rights for cooperatively financed U.S. payloads is a negotiated item with NASA and the customer. The availability of NASA-funded payload data is addressed in Item #98. (Richard Halpern)

Item # 106 (Denver):

What is the policy on establishing the number of dedicated polar orbiting satellites, tethered satellites, etc. that will be under the jurisdiction of Space Station Freedom?

Response:

In the Baseline Space Station Freedom Program, there are two Polar Orbiting Platforms, one provided by the U.S. and one provided by ESA. Other orbiting satellites would be considered on a case by case basis. (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 107 (Denver):

Power generation will be a major limiting factor to the growth of Space Station Freedom. Who determines the priority of daily/weekly power consumption by Space Station Freedom itself and its "tenants"?

Response:

The Consolidated Operations and Utilization Plan (COUP) will outline what proportion of Station resources will be dedicated to users and what proportion will be dedicated to Station operations and housekeeping. The Multilateral Coordination Board (MCB) will approve the COUP which is the strategic plan at L-5 years. The Tactical Operations Plan (TOP) is the 2 year plan that refines the COUP. The Increment Plan for each flight increment refines the TOP. Operations execution will be the joint responsibility of the Space Station Support Center (SSSC) and the Payload Operations Integration Center (POIC). The SSSC will have responsibility for real-time Station systems planning and operations (including real-time resource allocations). (David Brannon)

Item # 108 (Denver):

Who will be managing the priority for relaying data, and what research is being conducted to alleviate this major limitation?

Response:

Payloads will be operated on a scheduled basis. The schedule for on-orbit operations is the result of a multi-level integration and planning process involving users in all phases:

- A. Strategic level (5 years prior to flight)
- B. Tactical level (2 years prior to flight)
- C. Execution level (through termination of payload operations)

During on-orbit operations while payloads operate simultaneously and gather data, it will be telecommunicated (at an aggregate rate of 300Mbps) to user data operations facilities in "near real-time as required." (Richard Halpern)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 109 (Denver):

What data privacy provisions are established for protecting commercial data transmissions from Space Station Freedom?

Response:

The Space Station Freedom Program will adhere to U.S. Government laws and regulations concerning protection of telecommunicated data which may include encryption. The Space Station Freedom Program will not provide data encryption services for users, but will accommodate the encrypting of data by users, consistent with safety requirements. **(Richard Halpern)**

Item # 110 (Denver):

What are the Space Station Freedom provisions for securing remotely sensed data?

Response:

Data may be encrypted at the sensor and downlinked through the DMS and TDRSS to the ground. Encrypted data may also be transmitted through users supplied antennae to private ground stations. **(David Brannon)**

Item # 111 (Denver):

Who is developing a technical "clearing house" which would review and prioritize requested additions to Space Station Freedom hardware such as new permanent Earth resource data collection instruments?

Response:

The Office of Space Station Utilization Division (Code SU) will review and prioritize all payloads. **(David Brannon)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 112 (Nashville):

NASA should examine the possibility of allowing the direct downlink to be done commercially.

Response:

Direct data downlink is currently being proposed as a new SUMITS entry by the Boeing/Peat Marwick Commercial Space Group. Licensing and frequency allocations are the main concerns as a commercial venture. The Boeing/Peat Marwick Group is in the process of identifying a commercial provider for this service. (David Brannon)

Item # 113 (Nashville):

NASA needs to increase the OCI spatial resolution in the region where MODIS is lacking from 500m to 200-300m to perform all imaging activities.

Response:

NASA agrees this is a valid requirement, but is having difficulty justifying it on an economic basis. Panels of scientists and users have looked at the complex trade-offs between high resolution and data in all areas and realized it is impossible to obtain both. If industry provides such an instrument and can make it commercially viable, NASA is willing to accept it. (Shelby Tilford)

Item # 114 (Nashville):

NASA needs to consider 10 areas of research opportunities in the non-renewable remote sensing area listed below.

- (1) experimental radar with multi-frequency, multi-polarization variable depression angles
- (2) experimental precision laser altimetry with high resolution registered optical imagery (GLARS)
- (3) multispectral thermal IR
- (4) narrow-band imaging spectrometer with tunable bands and bandwidth (5MM)
- (5) passive fluorescent detection research
- (6) detection of hydrocarbon seeps and spills (offshore and on land)
- (7) parametric evaluation of solar illumination angle and plane of incidence
- (8) capability for ice monitoring to support non-renewable resource development
- (9) precision topographic mapping capability
- (10) gravity satellite

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Response:

NASA is currently conducting research in all of the areas listed above except (6) - detection of hydrocarbon seeps and spills. NASA is willing to accept proposals in all of these areas for consideration. The following addresses the current activity recommended in each research area:

- (1) Synthetic Aperture Radar (SAR) addresses this area
 - (2) being considered at the present time as a possible/potential instrument on EOS
 - (3) being considered at the present time as a possible/potential instrument on EOS
 - (4) main objective of the High Resolution Imaging Spectrometer (HIRIS) program on EOS
 - (5) accomplished as part of the ACFT program
 - (6) willing to accept proposals
 - (7) HIRIS/MODIS programs address this issue
 - (8) looking at three techniques to accomplish this
 - (9) three working groups are studying this intensively/workshop report due to be published in 1989
 - (10) extended phase A studies underway
- (Shelby Tilford)
-

Item # 115 (Nashville):

NASA and industry should identify mechanisms to encourage combined radar and visible imaging development for the 280 platform.

Response:

NASA agrees that this is a good recommendation and encourages it. If industry can provide a viable proposal, NASA Code EE will support it. NASA believes, however, that combining radar and visible imaging must first be looked at for the polar platform development. (Shelby Tilford)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 116 (Nashville):

NASA should add the capability to provide analog data from both the 280 (electronic and film) and the polar platforms (electronic).

Response:

This capability already exists from the 280 platform. However, currently there is no consensus that electronic analog capability is adequate for the polar platform. All of the current working groups see no defined requirements as to how it would be used, but they are not ruling it out. NASA is willing to consider private sector recommendations for this service. (Shelby Tilford)

Item # 117 (Nashville):

NASA should add a new mission to the MRDB for a ground/ice probing radar.

Response:

NASA will welcome valid industry proposals for this system. If the proposal is commercially viable, NASA will support the effort. A ground/ice probing radar would be consistent with the 280 platform design and could be incorporated into Space Station Freedom development. (Shelby Tilford)

Item # 118 (Nashville):

The federal government should clarify or modify current policy limiting satellite imaging data spatial resolution to enable U.S. domestic companies to compete internationally.

Response:

The Administration sent to Congress on January 25, 1988, a new space policy agenda in the form of a Commercial Space Policy. Although the nonclassified version does not specifically state what the new limits of spatial resolution are, numerous documents reference the five meter (in some cases "or lower") limit. This listing of the imaging resolution cap now makes U.S. policy consistent with the international norm and will allow U.S. companies (other things being equal) to compete internationally. (David Brannon)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 119 (Nashville):

NASA should maintain the place holder mission (TDMX 2262) for manned observations.

Response:

NASA sees no commercial justification for this requirement. Since the capability exists for Space Station Freedom personnel to carry out manned observations, NASA is unaware of the rationale behind this requirement. NASA is willing to consider this recommendation if adequate justification can be presented. (Shelby Tilford)

Item # 120 (Nashville):

NASA needs to examine the current polar platform servicing schedule. The current schedule is unacceptable. A proposed solution is to provide redundant sensors on the ESA as insurance.

Response:

NASA agrees that the current polar platform servicing schedule may be inadequate. However, it is not within the budget capability to improve that schedule at this time. The minimal service schedule will require sensor redundancy to meet requirements during a failure; however, it is too costly for total sensor redundancy. (Shelby Tilford)

Item # 121 (Nashville):

NASA needs to commit early to the Geostationary (GEO) platform to support industry in the technology development required to deliver continuous real-time data capability that many advanced applications will require. Industry should be included on the GEO platform planning committees.

Response:

A science working group, which includes strong industry participation, has been established to look at what the platform requirements need to be. This requirements definition will be followed by a cost study to determine resource needs. However, before any commitment can be made, the budgetary issue must be addressed through the normal NASA channels. The GEO Platform is one component of the Sally Ride Report "Mission to Planet Earth" and most likely will not come to fruition before the year 2000. (Shelby Tilford)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 122 (Nashville):

NASA should explore government/industry sharing of instrument and data costs. (Addressing proprietary rights and co-funding issues.)

Response:

The issuance of NASA's EOS AO identified several mechanisms for sharing instruments and data costs. Scientific participation can be proposed in three areas of investigation: research facility instrument team member and team leader proposals, instrument investigation proposals, and interdisciplinary investigation proposals.

The issue of proprietary data rights is not being addressed in this AO. However, the NASA/Office of Commercial Programs Task Force on Commercial Uses of Space - Earth and Ocean Observations Steering Committee has identified this issue as one of the major limitations to establishing a competitive remote sensing industry. **(David Brannon)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

LIFE SCIENCES

Item # 123 (Denver):

To what extent do commercial life science investigators need to consider what is available and once having done so recognize what additional requirements they are going to have to put into the system?

Response:

1) Considering What is Available

An extensive inventory of multipurpose space qualified life science equipment has been developed through the Office of Space Science and Applications, Life Sciences Division. Commercial life science investigators can benefit significantly from this equipment in two ways: First, through the potential use of this equipment in collaboration with the Life Sciences Division on experiments and missions where a community of interest exists. Second, the commercial life science investigator can also benefit from the lessons learned from previous OSSA Life Science missions, i.e. how the equipment performs and what opportunities exist to improve the existing equipment.

2) Future Requirements

The future requirements for commercial life science users are likely to be similar to the OSSA Life Science requirements. At the present time, through the Commercial Life Sciences Working Group, CCDSs, and individual companies, the Shuttle and Space Station mission requirements are being collected, organized and submitted to the Office of Commercial Programs, Commercial Development Division. (Larry Milov)

Item # 124 (Denver):

What proportion of the investigators are actually funded from the Center for Cell Research at Penn State?

Response:

Between 30 - 50%. All of these individuals have their own active research projects and are coming on board because of their interest in the space program and the obvious ramifications of working with industry. (Wes Hymer, Ray Whitten)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 125 (Denver):

Are magnetic effects being used like those used in non-union bone healing?

Response:

Yes, except the parameters are different. We reported three papers in October of 1988. One of which involves the application externally of radial and longitudinal coil to experimental animals. Another treatment was to immerse mice in a field generated by fairly large Helmholtz coils. Each treatment worked in the obviation of tail suspension effects, although some treatments worked better than others. There have been some demonstrations in which the plates did not generate very strong fields or not very well oriented fields. One must do the technical background in order for these to work. (Wes Hymer, Ray Whitten)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

INFRASTRUCTURE/INDUSTRIAL SERVICES

Item # 126 (Denver):

What is the difference between Space Station Freedom utilization and commercial infrastructure?

Response:

Participation in the Space Station Freedom program is possible through both commercial utilization and commercial infrastructure development. Utilization involves commercial "users" of Space Station Freedom such as industrial researchers, while infrastructure development involves commercial "providers" of Space Station Freedom systems and services, for example, an auxiliary power system or a material sample return system. Also, the issues, parties involved, and organizational elements required to support both utilization and infrastructure development are unique. Utilization issues include: manifesting, pricing, technical parameters, proprietary rights, as well as business issues, and infrastructure development issues center around: policy commitments, integration requirements, liability insurance, pricing, and the commercial system or service selection process. (Kevin Barquinero)

Item # 127 (Nashville):

Has anyone looked at the possibility or opportunity for a company interested in developing a facility and providing it to Space Station Freedom at their own cost and the Office of Space Station along with others leasing time on that facility?

Response:

A solicitation of interest was distributed for both the Neutral Buoyancy Laboratory (NBL), Johnson Space Center, and the Space Station Processing Facility to be constructed on-site at Kennedy Space Center. Seven questionnaires were returned regarding the NBL and 15 replies were received for the processing facility. In total, these 22 responses represent viable proposals.

Some of the respondent firms have displayed an interest in developing a facility at the company's own expense while leasing the capacity to both Space Station as well as non-U.S. government customers. Even though commercial interest has been demonstrated, two significant issues remain unresolved: the legislative language of contract termination liability and NASA's ability to commit to long term use. Commercial investment and involvement will be dependent upon the enactment of termination liability authority and the Congressional approval of multi-year contracts for both of these facilities. (Kevin Barquinero)

SPACE STATION FREEDOM WORKSHOPS
RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 128 (Nashville):

NASA should lease reusable space transportation services rather than developing and operating the technology-privatization of new or existing systems.

Response:

NASA agrees with this recommendation to specify service requirements as opposed to hardware specifications and encourages it. Furthermore, NASA fully supports the President's Space Policy and Commercial Space Initiative which states "Federal agencies will procure existing and future required expendable launch services directly from the private sector to the fullest extent feasible." (Barbara Stone)

Item # 129 (Nashville):

NASA should standardize risk versus cost analysis within NASA.

Response:

A standard for risk versus cost does exist for man rated systems. Adherence to a risk standard is directed by Code Q Office of Safety, Reliability, Maintainability, and Quality Assurance. Johnson Space Center implements the standard through the various NASA facilities. (Charles Jackson)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 130 (Nashville):

NASA should create a space transportation "post office" that purchases all forms of space transportation to drive down the cost and expand the market.

Response:

NASA supports the President's policy to "...procure existing and future required expendable launch services directly from the private sector...." Requests for space transportation to meet NASA requirements are made through standard NASA RFP procedures published by the NASA Office of Procurement.

NASA Code M, Office of Space Flight, provides customer service to identify ELV or STS launch requirements. Once identified, a commercial user would then negotiate their own contract for that service, either with NASA in the case of the STS or with the private transportation vendor for ELV service.

NASA believes in fair and open competition and the right for anyone to compete in the competitive process. NASA does not believe that a "post office" would increase market size, resulting in decreased cost. NASA believes that the competitive process will achieve this through increased market awareness, stimulation, and need. (Mike Smith)

Item # 131 (Nashville):

NASA should establish an outreach program to inform nonaerospace corporations about space transportation opportunities.

Response:

NASA's Office of Commercial Programs has an outreach program designed to stimulate and encourage interest and investment in a broad range of commercially oriented space-related opportunities, including transportation. Emphasis on non-aerospace industries is a key element of the NASA strategy. A variety of mechanisms are being employed to deliver information to such firms. For example, OCP is publishing a new catalog of hardware, facilities, and services for commercial users of space, and existing outreach efforts. The Boeing-Peat Marwick Commercial Space Group and NASA Industrial Application Centers, an integral part of NASA's outreach program, provide client firms with ready access to information concerning commercial space opportunities, including transportation. The Commercial Use of Space Task Team assembled by OCP to recommend new initiatives included a User Outreach and Development Subpanel designed to inform corporations about space opportunities. (Jim Ball)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 132 (Nashville):

NASA should ensure parity between commercial and government requirements for mission licensing agreements.

Response:

Licensing agreements for space transportation is the responsibility of the Department of Transportation. The concern about parity between commercial and government requirements for mission licensing agreements is not fully understood. NASA will welcome any further discussion on this topic to address specific concerns. (Barbara Stone)

Item # 133 (Nashville):

Any product that will be marketed to non-NASA users must still have NASA's seal of approval.

Response:

Code C agrees in principle that NASA should not have approval on all products marketed to non-NASA users. However, in situations that affect safety or require system integration, NASA must have approval. (Stacey Edgington)

Item # 134 (Nashville):

The Office of Commercial Programs (OCP) should encourage development of zero-gravity robotics technology in the near term and establish an agreement between industry and OCP for this activity.

Response:

OCP is currently sponsoring two CCDS in the automation and robotics discipline to develop robotics for commercial space applications. OCP will emphasize more automation and robotics in future CUS activities. (Ana Villamil)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 135 (Nashville):

NASA should meet with the FCC and major satellite communications companies to explore the potential and develop a market strategy for commercial capability to provide communications to and from ground and LEO via satellite.

Response:

While a commercialized data relay satellite system is a feasibility, there is a large monetary investment that would be necessary by industry. A market survey and the appropriate marketing strategy would have to be developed up front.

The present set of TDRSS spacecraft is expected to provide support to the user community into the late 1990s. This includes the ability to meet the requirements of the Space Station Freedom Base, Platforms, and numerous free-flyers in the mission model. In addition, the European and the Japanese Space Agencies are planning data relay systems conceptually similar to the TDRSS. A panel has been formed to examine interoperability potential among the systems thereby reducing TDRSS loading.

To prepare for the 21st century, we are conducting preliminary studies for an advanced TDRSS that will meet the needs of the current and new generations of missions. It is feasible that a commercialized system could be developed that would provide the necessary support. The monetary investment would be very significant and the results of a market survey would be a major factor. (Eugene Ferrick)

Item # 136 (Nashville):

NASA and the telecommunications industry should jointly explore the market potential and feasibility of communications to and from ground to LEO via ground stations.

Response:

Currently, NASA does not know the viability of commercially provided ground based communications service to and from LEO. At present, the Air Force as well as the major system providers deliver that service. NASA will, however, entertain proposals from industry and if feasible, support this effort. (Ray Arnold)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 137 (Nashville):

NASA should assemble a summary of literature on innovative launch facilities and outline the related technical concepts and work with interested organizations to work out NASA/Space Station Freedom interfaces, communications, etc.

Response:

NASA is currently preparing a report on Expendable Launch Vehicles (ELV) for Commercial Space. One of the objectives of this study is to determine whether a small payload market exists. If, after the completion of this study, it is determined that there is a sufficient small payload market to justify the need for alternative launch facilities, NASA will examine the possibility of developing such a document.

Commercial organizations interested in interfacing with NASA should contact Code C, Office of Commercial Programs. Code C will provide appropriate code contacts within NASA to address particular technical needs. (Peter Eaton, Ray Whitten)

Item # 138 (Nashville):

NASA Goddard Space Flight Center should facilitate the establishment of generic standards and interface requirements for Space Station Freedom robotics and tools.

Response:

NASA will design all robotic systems incorporating standard interfaces. These standards will be documented in the program requirements document and based on the mission requirements established for robot systems expected to be completed with phase B. (Greg Swietek)

Item # 139 (Nashville):

NASA needs to develop a ship-based platform launch facility.

Response:

A ship-based platform launch facility is an interesting concept, and one that has been tried before. The problem with a ship-based launch system is that it is economically infeasible. Although it would provide a great deal of flexibility in launch locations, a ship used for simple systems would have low usage, based on current estimates, compared to the operations and maintenance costs associated with the ship. For more complex launch systems, the cost of the ship itself would be difficult to justify.

If market demand increased in favor of ship borne launches making this type of system economically feasible, then NASA would consider this type of development.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Another commercial opportunity may exist in the area of tracking and telemetry. As TDRSS takes over this role for NASA, NASA will close several of its down-range tracking and telemetry stations. If a market were to exist for a non-TDRSS tracking and telemetry service aimed at supporting low technology or more routine missions, commercial or otherwise, this service could be provided commercially. A company could take over operation of the facilities or develop a fleet of mobile tracking and telemetry systems that can be deployed to a variety of non-U.S. launch sites or down range activities. (Peter Eaton)

Item # 140 (Nashville):

What will the commercial entity own and how can they control their assets once they are part of Space Station Freedom?

Response:

The concept of commercial infrastructure addresses the issue of ownership and control of assets. Space Station Freedom will provide the opportunity for a commercial entity to provide systems or services to customers associated with or utilizing Space Station Freedom. The firm providing the system or service will own and be responsible for the assets it brings to the Space Station Freedom/worksite. During the operation of the system, the commercial entity will pay NASA for resources consumed. The firm will bill any users of its services based upon the units consumed, utilizing a pricing system appropriate to the service.

NASA will provide greater detail regarding aspects of control of assets at a later date. (Kevin Barquinero)

Item # 141 (Nashville):

OCP should initiate discussions to explore the relative merits of establishing a Space Station Freedom operations agency or company.

Response:

The division of responsibilities between NASA and the private sector in the area of operations is important to the commercial infrastructure concept. Private entities will maintain responsibility over the systems, services and assets which they provide to the Space Station Freedom program. However, NASA intends to maintain overall control of Space Station Freedom operations. NASA encourages comments and suggestions in this area. (Kevin Barquinero)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 142 (Nashville):

Will U.S. regulatory restrictions on ownership apply?

Response:

The Space Station Freedom program will be bound by applicable U.S. and international regulatory restrictions. Commercial providers to Space Station Freedom will be informed of regulatory policy. As the commercial infrastructure policy is developed further, regulatory issues will be identified and addressed. NASA intends to solicit industry input as appropriate to determine whether excessive restrictions are being placed on commercial providers. Agreements for commercial Space Station Freedom-related infrastructure and services must be consistent with existing agreements between NASA and its Space Station Freedom international partners. (Kevin Barquinero)

Item # 143 (Nashville):

Will NASA support third party liability insurance?

Response:

It is currently NASA's policy to indemnify from the first dollar for third party liability for Middeck Payloads posing normal risk to the shuttle. For Middeck payloads posing above normal risk and for all cargo bay payloads, NASA will indemnify for third party liability above a negotiated threshold. Below that threshold, private entities are required to either purchase insurance or self insure.

The issue whether NASA will require users to purchase third party liability insurance for payloads on board the U.S. elements of the manned base has not been decided. It is expected that there will be a requirement and that NASA will indemnify the user for third party liability above the required insurance. (Jack Yadvish)

Item # 144 (Nashville):

Will safety/performance codes and standards be established and implemented?

Response:

Yes, at a minimum, current shuttle standards will apply. New standards applying solely to Space Station Freedom will be prepared and disseminated by the Office of Safety, Reliability, Maintainability, and Quality Assurance when they become available. (Charles Jackson)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 145 (Nashville):

Will penalties for nonperformance of commercial services and NASA service be set to cover a supplier unable to deliver due to a situation beyond his control?

Response:

NASA will not be liable to a commercial supplier of services where NASA fails to provide services, e.g., due to a NASA power supply failure. NASA will also not be liable to the user of the commercial supplier for such a failure. The commercial contract between the commercial supplier and the commercial user should address the liability of the commercial supplier to that user.

In the development of the Space Station Freedom reimbursement policy, it is expected that NASA will address to what extent and at what cost to the commercial supplier NASA should provide repeat services made necessary because of NASA's prior failure. **(Bob Wojtal)**

Item # 146 (Nashville):

How will OMB Circular A-76 tax and accounting procedures apply?

Response:

OMB Circular A-76 will not apply to commercial space activities requiring system integration or that impact the safety or function of the system. This circular is based on a straight line cost/benefit analysis for routine operations such as security or mail room services.

Space Station Freedom service operations proposed by commercial vendors are welcomed and will be examined on a case by case basis. This policy is consistent with the President's policy on Space Station Freedom privatization where NASA will "seek to rely to the greatest extent feasible on private sector design, financing, construction, and operation of future Space Station requirements, including those currently under study." However, OMB Circular A-76 will not contribute to the analysis of any proposals presented for services to be determined as critical or requiring extensive integration. **(Charles Tulip)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 147 (Nashville):

Modify government purchase regulations or federal laws to fully fund multiyear contracts and provide acceptable termination protection to help promote long-term contracts.

Response:

When full funding is not available for start contracts extending beyond the fiscal year in which awarded, they may then be incrementally funded. This method of contract funding is subject to Federal Acquisition Regulation (FAR) Subpart 32.7 and NASA FAR Supplement Subpart 18-32.7. An incrementally funded contract may provide a funding schedule and contains a Limitation of Funds clause. The clause provides for the contractor to notify the contracting officer in time for funds to be added before they are needed.

Termination protection is provided under the Limitation of Funds clause and the Termination for the Convenience of the Government clause. Under these clauses contractors are only obligated to perform up to the point where available funds would cover incurred costs, a fee or profit on the work done, and the costs of termination.

The regulations cited are based on the Anti-Deficiency Act, 31 U.S.C. 1341, which prohibits any officer or employee of the government to create or authorize an obligation in excess of the funds available, or in advance of appropriations. The Office of Management and Budget for many years has attempted to convince Congress to provide longer term appropriations to facilitate the acquisition process. Congress has been unwilling to do so. (Bud Maraist)

Item # 148 (Nashville):

Develop an accounting analysis system to provide for "true" comparisons in the government's make or buy decision.

Response:

NASA fully supports this request and stresses the need for the government to be consistent in its analysis of make or buy decisions. By the direction of the NASA Administrator, OCP is establishing a financial analysis capability within OCP to provide appropriate analysis for NASA top management decision making purposes. (Jack Yadvish)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 149 (Nashville):

Provide a zoning commission to handle system integration for add-on or growth services.

Response:

The role of zoning commission will be handled by the Office of Space Station Strategic Plans and Programs Division. They will manage the evolution of Space Station Freedom with Langley Research Center having technical responsibility. (Kevin Barquinero)

Item # 150 (Nashville):

Establish a mechanism to announce available opportunities in order to sustain competition for service franchise.

Response:

NASA encourages commercially initiated proposals and has developed draft Space Station Commercial Infrastructure Policy Guidelines which clearly spell out NASA's intention to evaluate proposals and implement commercial services associated with Space Station Freedom. The Agency has also developed a draft "Space Station Commercial Infrastructure Policy and Procedures", which clearly outlines the procedures and criteria by which it will evaluate commercial service proposals. The draft documents outline the process for both solicitation and commercial infrastructure proposal evaluation. The Office of Space Station welcomes comments on these guidelines and procedures. Once the review process has been completed, the final document will be released. (Kevin Barquinero)

Item # 151 (Nashville):

Offer proper franchise control.

Response:

NASA will develop a policy regarding exclusivity and control over the next two years. It is expected that the extent of competition and control for a service or capability will vary, depending on the type of service to be provided and on the opportunity for the private sector to provide the services. It may also vary based on the level of scarce NASA resources required by the provider to operate the service (e.g. power). (Kevin Barquinero)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 152 (Nashville):

Extend space patent laws to more than 17 years.

Response:

This can only be done by amending Title 35 of the U.S. Code which is under jurisdiction of the Senate and House Judiciary Committees. Past attempts to extend the patent term have been highly political and controversial and have taken years to go through the process. The United States Patent and Trade Office would probably oppose the idea because it would disrupt efforts to harmonize patent laws on an international scale. This would be much better pursued by private initiative to the committees. (Bob Kempf)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

INFRASTRUCTURE POLICY

A Space Station Commercial Infrastructure Policy panel met to discuss technical, business, financial, and policy questions and issues. The responses by the panel were in accordance with the draft Space Station Freedom Commercial Infrastructure Policy and Procedures that was released and distributed at the Denver workshop. This draft was released for the purpose of soliciting both internal comments from NASA personnel and external comments from industry. As of this publication date, this document is still in draft form. Any responses made by the panel during this session may be subject to change when this review process has been completed and the document is revised and approved. The draft Space Station Freedom Commercial Infrastructure Policy and Procedures appears in the Denver Space Station Freedom Workshop Proceedings.

Item # 153 (Denver):

If we are going to interest industry in investing and providing a facility or a service, we must give them some kind of monopolistic position. Have you looked at how we can do that under current legislation?

Response:

NASA office is open to whatever needs to be done. There are ways under JOFOD and the Space Act in which you can enter into, perhaps not monopolistic, but certainly unique relationships. And, if you absolutely have to have a monopolistic relationship and you can sell it politically, I think NASA can do it. **(Infrastructure Policy and Procedures Panel)**

Item # 154 (Denver):

Are there enough resources within NASA to conduct multiple competitions?

Response:

It is a real issue and it concerns NASA. It really depends on the number of proposals we receive. The objective of the three level screen process is to minimize the impact on NASA resources. The initial screen will serve as a funnel to narrow down the number of proposals. **(Infrastructure Policy and Procedures Panel)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 155 (Denver):

Does NASA have the will to use the public interest justification?

Response:

The administrator has discussed in a number of meetings the possibility of using that exception. If the right situation came up, there would be no reluctance on the part of the Agency to use it. The Agency can seek an exemption from CICA, some of which have to go to Capitol Hill, others are subject to review by the General Accounting Office and subject to protest. Just because NASA believes that it has met an exception does not mean that a competitor or someone else believes the same. NASA may be willing to go forward, but there may be a process that will stop us. **(Infrastructure Policy and Procedures Panel)**

Item # 156 (Denver):

What is the availability of the proposal preparation guidelines covering the format and content?

Response:

The Office of Commercial Programs developed a draft commercial infrastructure policy, criteria and procedures document and published it internally in February 1989. The guidelines are being prepared now and should be available toward late summer, 1989. This document concentrates on infrastructure policy for all commercial space endeavors. The Office of Space Station has developed and issued the draft Space Station Freedom Commercial Infrastructure Policy and Procedures which applies specifically to Space Station Freedom. Once the review process has been completed, the final document will be released. **(Mike Smith)**

Item # 157 (Denver):

There was an issue concerning keeping the cost down for the proposer in preparing the proposal and trying to keep the initial screen easy for both parties.

Response:

It turns out minimizing the documentation required to put together a proposal often causes problems. I think what we are looking for when you get into these big ventures, where there is an awful lot of money involved and it is a substantial venture, you have to look at the details of the boiler plate - it is in the detail where the problems arise. And NASA is trying to work out and make sure that we get that kind of detailed information so that we can discuss any discrepancies during the negotiation process. **(Infrastructure Policy and Procedures Panel)**

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 158 (Denver):

Due to the resulting high risk and upfront costs when a company performs a cost-risk benefit analysis, the benefits which, for the company to pursue this venture, are going to have to be of greater value than typical for a government procurement, including higher returns.

Response:

It turns out that in the engineering world, we are all used to the scientific method in how you tackle things, that certain logical way; while in the business world, they are used to the case method where you look at the thing as a whole for the economic impact. As part of understanding these cases, we have learned that high rates of return are how you get the commercial, private sector interested. In fact, we are going to be doing case methods on every proposed venture as it goes through the process, understanding and allowing high rates of return where it is appropriate. (Infrastructure Policy and Procedures Panel)

Item # 159 (Denver):

I think you hit on a point earlier in the discussion when you talked about getting information out of industry. You are asking commercial enterprises to write proposals to the Government. They don't do that, that is not commercial. They do an internal evaluation of whatever the project is, they do a computation on potential return, and if they want to do it, they do it, assuming it's not illegal. How are you going to get competitively secret information?

Response:

I can't answer that particular scenario. But in the example where the private sector wants to use government facilities as part of their venture and operate in space, then that part of a proposal has to come forward.

There is a Federal criminal statute which makes Federal employees liable, criminally liable, that means jail time, real hard time, for releasing proprietary information submitted to the government for a government program. I think NASA has done a good job of protecting your (industry's) data. If you think that these kinds of commercialization initiatives bring up additional proprietary concern, let's hear about it.

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Depending on the dollar amount, industry does reveal a lot of financial information on industry-to-industry proposals. The communications satellite vendors that responded to Intelsat gave excruciating cost and financial information to Intelsat in their review because of the high dollar amount involved. On the other hand, we have seen other companies where they were trying to procure or lease maybe 6 or 12 transponders and they asked for the same level of information which was not provided because the dollar amount was not significant enough to the company. It's going to depend on the terms of the venture itself. (Infrastructure Policy and Procedures Panel)

Item # 160 (Denver):

How is foreign partnership or participation viewed?

Response:

I think you have to understand that if you're talking about an agreement with NASA that gives you a sole source or locks you in as a prime supplier, there is going to be concern on the Hill if the company is owned and controlled by a foreign entity. We are not saying that you can not have foreign participation. Again, it's going to be a case by case basis. A lot of times we are going to look to you and say, "Tell us how you structured it so that we can get around this problem." Again, we count on your creativity and we hope that we can manage it. (Infrastructure Policy and Procedures Panel)

Item # 161 (Denver):

When are the costs of Space Station Freedom services going to be established?

Response:

There is a report prepared that is taking a first cut at a cost reimbursement policy that is going to the Congress very shortly, but that is only the first step. As you know, the whole question of how you price services like that is governed by what you want to accomplish with that pricing policy. It is something that NASA may generate, but it becomes a very political document. (Infrastructure Policy and Procedures Panel)

SPACE STATION FREEDOM WORKSHOPS

RECOMMENDATIONS/ISSUES/QUESTIONS RESPONSE

Item # 162 (Denver):

The problem of trying to do something commercially is the uncertainty of a pricing policy. If my company has a number, it either makes it or breaks it.

Response:

In fact, that concern is something that we ought to communicate not only to the program, but to the administrator to say that not only do we need a pricing policy, but one that we have some degree of certainty that is going to remain stable. (Infrastructure Policy and Procedures Panel)

Item # 163 (Denver):

Why is there a \$5,000 processing fee?

Response:

NASA found out that if you do not have a fee, just anyone can participate. There is a fee structure I can set which will make people think about it before they send in a proposal or at least think if they have to go and borrow the money. NASA is allowed to cover basic costs. To avoid getting a thousand proposals, I asked them to write out the check and submit the proposal.

It is not cashed right away, but it is requested right away. NASA's feeling is that if a proposer cannot give us \$5,000, he is not going to get the financing to do the venture. If you are not willing to give us \$5,000 to view this proposal, I can question one's ability to spend the money to do it right. It is a relatively small amount of money compared to the cost of doing even a small infrastructure venture. (Infrastructure Policy and Procedures Panel)

Appendix A

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